SHAPING ENVIRONMENTAL "JUSTICES"

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DECLARATION OF ORIGINALITY OF SUBMITTED WORK

In conformance to University regulations, I hereby declare that:

1. this thesis has been composed solely by me;

2. this thesis is entirely my own work; and

3. this thesis has not been submitted in part or whole for any other degree or professional qualification.

Signed…….

Date…….

NOTICE OF PUBLICATION

With permission from my supervisors, parts of the thesis have been peer-reviewed and published as the following:

In English:

Huang, C. T. and R. -C. Hwang (2009a). "“Environmental Justices”: What we have learned from the Taiwanese environmental justice controversy." Environmental Justice 2(3): 101-108.

The Lanyu case in chapter 6 especially draws on this article. However, this thesis provides more comprehensive analysis on this issue.

In Chinese:

My original research proposal attempted to trace the idea of EJ and investigated its origins, its shaping/reshaping process, and its expansion to other countries and to the globe. It covered a broader scope than this thesis, including five cases: the US case, the Taiwanese case, the UK case, the international waste trading case, and the climate justice case. Considering limited space, this thesis only deals with the US and the Taiwanese cases. Some initial comments regarding these five cases scattered in the following Chinese articles.

Huang, C.-T. and R.-C. Hwang (forthcoming). "The adoption of environmental justice: Are Americans and Taiwanese talking about the same environmental justice? ." National Development 9(1): Not yet known.

Huang, C.-T. and R.-C. Hwang (2009). "The economic perspective of environmental justice: Can we solve EJ problems without abandoning economic thinking?" State and Society(6): 51-102.

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ABSTRACT

This thesis investigates the concept of environmental justice (EJ) by tracing its origins, the process of its shaping and reshaping, and its adoption in Taiwan. EJ addresses the phenomenon of disproportionate distribution of environmental risks among social groups. As no one can actually "see" how risks are distributed, one has no choice but to rely on scientific (or other) techniques to visualise and then conceptualise these risks. After so doing, EJ has been turned into specific indicators to gauge EJ/injustice and the technical methods to measure it, even though the scope of these concerns is much broader and goes far beyond the technical. Using detailed historical exposition in tandem with interviews, this thesis seeks to demonstrate the processes that have led to the dominant constructions of environmental justice.

The main argument of this thesis is that the phenomenon of EJ/injustice is a condensation of power relations/struggle, and the discourses that describe and the measures that gauge it are an expression of this struggle. Specifically, in this thesis I attempt to show that EJ is being constructed through the very process of debate among EJ supporters and with their challengers. Seen from this angle, this thesis shows that the conceptions of EJ differ and are mutable. To say that these conceptions change is not to deny that there is environmental injustice, but to recognise that the key characteristics can be categorised or explained differently.

This research discloses that claims about EJ can be framed in much greater variety in terms of identity, difference, territory and governance. This thesis suggests that although understanding EJ through specific indicators and some sorts of techniques are necessary, a just society cannot be achieved through scientific research alone. The question of how much or what sort of data is sufficient to prove the existence of (in)justice is not a scientific one, but a social one. Our research could become much more meaningful if we recognise the specificity and limitations of the dominant approach and if the phenomenon of EJ/injustice is put in context. To achieve this, our intellectual endeavours should be properly conceived as being about a theory of endless political struggles over the issue, rather than simply about "discovering" EJ.

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AEC	(Taiwanese) Atomic Energy Council
AIRS	Aerometric Information Retrieval System
BRS	Biennial Reporting System
CKD	Cement kiln dust
DPP	(Taiwanese) Democratic Progressive Party
EHIAs	Environmental High Impact Areas
EJ	Environmental justice
EO	Executive Order
EPA	Environmental Protection Agency
EPZ	Emergency planning zone
GAO	General Accounting Office
GIS	Geographic Information System
KMT	Kuomintang (Taiwanese nationalists party)
LULUs	Locally undesirable land uses
MAUP	Modifiable areal unit problem
MEI	Maximally exposed individual
NEJAC	National Environmental Justice Advisory Council
NEPA	National Environmental Policy Act
NPL	National Priority List
NIMBY	Not-In-My-Back-Yard
OMB	Office of Management and Budge
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated biphenyls
RCRA	Resource Conservation and Recovery Act
PIMBY	Please/put-In-My-Back-Yard
RISE	Residents Involved in Saving the Environment
SADRI	University of Massachusetts's Social and Demographic Research Institute
SMSAs	Standard Metropolitan Statistical Areas
SSK	Sociology of Scientific Knowledge
STS	Science, Technology and Society
UCC	United Church of Christ's Commission on Racial Justice
TDH	Texas Department of Health
TEPA	Taiwanese Environmental Protection Agency
TRI	Toxic Release Inventory
TSDFs	Hazardous waste treatment, storage and disposal facilities
UCC	United Church of Christ's Commission on Racial Justice

1 Introduction

1.1 Prelude from the news of the 8/8 floods

On 8th August 2009, Taiwan suffered the worst flooding in its recorded history. During its peak between 8th and 9th, Typhoon Morakot brought more than 2000 mm of rain in several areas. Torrents of water rushed down mountains and submerged farmlands, forcing the evacuation of hundreds of people. With the nation's attention focused on the horrifying scene where the Jinshuai Hotel in Jhihben, Taitung County, collapsed into the river after its foundations were eroded by floods, most people did not expect that the worst was yet to come. After the peak of typhoon, the cost and the destruction it wrought started to become evident. A huge area of southern Taiwan was flooded by the record-breaking rain. More than 600 people died and about 50 were reported missing, most of whom are feared dead. Among the death toll, most were buried alive by massive mudslides in Xiaolin, a mountain village with 1300 residents. Weeks after the typhoon hit, a large part of Taiwan was still covered by mud and some rural residents were still trapped in the mountains because roads and bridges were blocked or washed away by water, rocks, and mudslides. Yet more shocking news was to come, when a rescue helicopter, working to transport mudslide survivors, crashed into a mountain on 11th August, killing all onboard crew (such as CBN News 2009:199; Branigan and McCurry 2009a; 2009b).

In the wake of Typhoon Morakot (subsequently named the 8/8 floods), a major local English-langauge newspaper produced a series of follow-up reports. They concluded that the present crisis bears some similarity to the catastrophic consequences of Hurricane Katrina (Taipei Times 2009b). Comparing the two, the paper reached the conclusion that Taiwan's president, Ying-jeou Ma, had failed to learn the lessons of Bush's mistakes in the aftermath of Katrina. Just like Bush's cold response in New Orleans, Ma was also a president far from his people. His apathy, they asserted, was unforgivable.

Ma's indifference and apparent isolation from human suffering have greatly damaged his image and his leadership. One month after the 8/8 floods, Ma's Premier, Liu Chao-Shiuan, accepted responsibility for the administration's slow reaction and stepped down. At about the same time, the government established the Typhoon Morakot Post-disaster Reconstruction Council[1] to take over the ineffective disaster relief mechanism.

Neither typhoons nor flooding are new to the Taiwan's people and government. Activists and politicians alike were unanimous in asking: despite decades of having to deal with such problems, how could this happen—again? Some asked a tougher question: if the floods had submerged northern Taiwan where the central government and financial centre are located, would the government have acted differently? This question aroused a great deal of anger. The Taiwanese government has long been criticised for policies which favour the financial north over the industrial south. More seriously, the rural east, home to most of the indigenous peoples, is treated poorly under its unbalanced policies. The victims of Morakot felt that regional injustice was the very reason they were abandoned by the central government.

As the nation's attention shifted from the immediate need for disaster relief, to the less frenzied processes of recovery and reconstruction, and as people, politicians and the media began to gauge the impact of the disaster, the issue of environmental justice [2] (EJ) appeared on the political radar. Perhaps because of the striking similarities between 8/8 and Katrina, people are keen to scrutinise the 8/8 floods through an EJ lens. Suddenly, EJ became the height of fashion. Several non-governmental groups organised conferences to establish the cause of this catastrophe. The *Green Party Taiwan* held a roundtable talk (2009) revolving around EJ. Other organisations also scrutinised the structure of the Reconstruction Council from an EJ viewpoint. This council is composed only of local politicians and civil engineers.

[1] See: http://88flood.www.gov.tw/ .

[2] As most literature, I use the term, environmental justice or EJ, loosely to mean the general focus of it. In fact, my whole thesis is about the fact that what EJ is varies according to the definitions, hypotheses, and measurements we employ. In subsequent chapters, I will argue that what EJ is depends on the way *activists/researchers* use *techniques* to *measure/interpret* this *phenomenon* and then make their *claims* on it. Further, I will demonstrate that the way that EJ has been claimed later reaffirms what EJ is.

Since environmental groups are completely excluded, the Council, they argue, is nothing but an unjust administration (Ceng and Abuu 2009).

Meanwhile, the Taiwanese STSers (Science, Technology and Society) also latched onto this pro-EJ trend. On their mailing list[3], STSers enthusiastically exchanged information and debated what STS can do to help Taiwanese society overcome the Morakot trauma. In so doing, some started disaster-related classes in the coming semester; others decided to organise a reading group to absorb the experience from Katrina. The special issue of *Social Studies of Science* (37/1) was designated by the reading group as the key reading[4]. Among a range of post-Katrina discourses, EJ is arguably one of the strongest traditions (Elliott and Pais 2006; Welbourne 2006; Allen 2007; Colten 2007; Kurtz 2007; Bullard 2008; Bullard and Wright 2009; Social Science Research Council 2009).

Whilst flooding and hurricanes are Acts of God, their disastrous consequences are largely preventable. This is one of the lessons of Katrina, as well as the 8/8 floods. When a disaster of such magnitude hits, there is only so much individuals and charity groups can do; the central government is the sole organization with the authority and resources to prevent further damage. Thus, the poor level of government preparedness, limited flood-prevention construction and slow emergency response are, at least partly, to be blamed. These issues leave much to be desired (Taipei Times 2009c; 2009d). To sum up, one month after Morakot, the lively debate about whether EJ was the fundamental cause behind the tragic scenes in Taiwan was still going on.

To hear the comments above, one would easily get the impression that Ma's Administration must be rather ignorant of EJ. But that is not so: EJ was in fact the very foundation of his 2008 presidential campaign. His environmental policy began with the commitment that he will realise EJ through information-opening and public engagement (Ma 2008). In other words, Ma is, or should be, an EJ president. It is

[3] The author is on this mailing list. Most of the discussion about Morakot was concentrated in September 2009.
[4] See their website: http://homepage.ntu.edu.tw/~sts2009sts/index.html

ironic that Ma's EPA (Environmental Protection Agency) administrator is very pro-EJ as well. Although Premier Liu's cabinet suffered a general resignation in September 2009, the Taiwanese EPA (TEPA) chief, Shen, Stephen Shu-Hung, is one of the few ministers who stayed in his position. Shen has reiterated that the ultimate goal of his EPA is to crystallise Ma's EJ agenda (TEPA 2008). Arguably, Shen's staying-put signifies nothing but Ma's determination to achieve EJ. As we see, politicians, experts, environmentalists and even the government are all chanting the mantra of EJ (Wang 2009; Yang 2009). If EJ is everyone's answer: what is the question?

To answer this, one must go back to the birthplace of EJ, the US, to scrutinise how EJ is shaped, contested, reshaped and then exported to Taiwan and other countries. The dynamic nature of EJ has rarely been questioned, as it was previously considered self-evident. In the US, the issue of EJ has gained considerable attention within the media and among politicians within the last few years, particularly after Katrina. EJ is by no means a new idea. As a concept that proposes a coalition between the environmental movement and advocates for civil rights and social justice, EJ has already been addressed for more than three decades.

Gathering momentum in the 1980s, the EJ rubric was born in local resistance struggles against the discriminatory distribution of environmental risks. In the US context, the charge of environmental racism, later the EJ, resonates with a bitter history of racial discrimination and with concern for human rights. In time, EJ attracted a great deal of public attention. Facing the challenges posed by the issues of EJ, two distinct social movements—the civil rights movement and environmentalism—were rethinking their priorities. Before long, the emphasis of EJ was brought to the foreground of these movements and a lively intersecting discourse also developed around EJ. Differentiated from other environmental movements, the traditional usage of the term EJ does not centre on how to protect the environment itself, but on the equitable distribution of environmental goods and bads. Echoing this, much work has been done in an attempt to reverse the trend which led to only a small fraction of population shouldering the greatest environmental burden.

The coalition between environmental and social movements has, thus far, not fulfilled its early promise. Early in the 20th century, the mainstream environmental movements usually employed symbols like the photographs of the earth taken from outer space, or the pictures of wounded animals/devastated forests to emphasise that people have a responsibility to nature. As a result, discussion about environmental movements, tended to conjure up images of bird-watchers or nature lovers. The general perception of the mainstream movement was of White upper- or middle-class people concerning themselves with conserving a wilderness or protecting animals from extinction. Fearing that the alliance would dilute their effectiveness and detract from their ability to attract new members, environmental groups tended to keep their movement separate from general social movements (quite a few literature can be found on this topic, see: Taylor 1992; Mohai and Bryant 1998; Mohai 2003; Rhodes 2005; Whittaker, Segura et al. 2005).

Wishing to dislodge the traditional "wealthy environmentalist" label, the mainstream environmental movements are increasingly highlighting the relationship between environmental damage and society's most vulnerable groups. Instead of concentrating on the ways people destroy the environment, activists now claim that the environmental movement should refocus on the ways a polluted environment destroys "people". They further assert that people of colour were, and still are, the greatest victims of environmental damage and that Black people's exclusion from existing, more traditional environmental movements was a result of the biases of the wealthy Whites who ran them. By promoting equal environmental rights, that is the environmental rights of all people regardless of colour, EJ activists and scholars are working to fight the imbalanced distribution of toxic waste. Much of this work employs science to systematically reveal the seriousness and the outcomes of this imbalance.

Right from the outset, EJ activists decided that the best strategy to highlight an issue in the public sphere was to demonstrate the seriousness of the problem. Research was conducted in an attempt to prove the imbalanced distribution of toxic waste. Once

numerous tests confirmed unequal exposure/risk-distribution between different race and income groups, activists were then able to claim that scientific authority had proved the seriousness of environmental injustice. Again, this strategy has proved to be problematic.

Like all other former social movements, EJ has to engage with the contemporary treatment of environmental issues by using scientific analysis and argument. Research in EJ can be divided into two broad categories: facts and rights. Research into the "facts" uses empirical/scientific knowledge[5] to provide evidence of the existence of injustice, and, equally importantly, to identify its cause. Research into "rights" uses the theoretical/rights-based approach[6] which focuses on minorities' inalienable rights to fight the imbalanced distribution of toxic waste (Tesh and Williams 1996; Bowen 2001; Shrader-Frechette 2002; Maschewsky 2005; Fisher, Kelly et al. 2006). Within most discussions of the environment, the call for "the facts/rights" and the consequent battle to establish them has become a standard rhetorical feature.

Due to the connection between "scientific knowledge" and calls for "environmental action", activists are increasingly relying upon the authority of scientific evidence to persuade the public and responsible agencies to remedy the unequal sharing of environmental risks. The problem is this: although the quantity of scientific research supporting EJ has increased greatly over the past two decades the EJ research community remains bitterly divided, even over basic issues (Bowen and Wells 2002; Davidson 2003). This fact has forced the government and EJ movements to rethink their strategies toward EJ. This thesis will trace the history of the idea of EJ. It will investigate its origins in the US, its shaping and reshaping, and its expansion to other countries. I will demonstrate that behind its scientific façade, EJ is still

[5] The dichotomy between empirical and theoretical is loosely used here. In the following chapters, this distinction is the very thing I would like to challenge. In the common usage, empirical or scientific research relates input variables (mainly deprivation of individuals/social groups) to output variables (health or environmental impacts). Concretely, this kind of research uses statistical methods to measure the correlation between variables.

[6] Theoretical/rights based approach refers to all non-empirical study. For some social researchers, anecdotal evidence or case studies cannot confirm or reject the existence of EJ problems. Thus, some assert that EJ claims should not be based on such research. This argument is dubious, as we will witness that even in the scientific approach their claims turn out to be value-laden as well.

fundamentally a normative debate.

In the following section, I will outline the research methods that I chose to use in answering my research questions. In so doing, I will pay special attention to the sources of information available to me; also, I will explain the rationale for selection and use of documental data. As this research is essentially document-based, it is not ethically sensitive. Nonetheless, the limited number of interviews I conducted still poses some ethical concerns which I will address. In the final section I provide a roadmap of the whole thesis.

1.2 Research questions, design and methods

1.2.1 Research questions

This thesis scrutinises the development of the EJ concept and events in EJ history from the 1980s to the present. It describes how EJ has been shaped, contested, and reshaped in the US and then adopted in Taiwan. Three overarching questions are posed in my thesis as follows:

- How have the phenomenon and characteristics of environmental injustice, and the idea of EJ, been constructed, contested and "operationalised"?

- How has the way that EJ has been constructed affected the treatment of environmental injustice and the insertion of these issues into environmental policies, campaigns, and legislations?

- What are the normative goals and political implications of the contending EJ framework? What does my analysis suggest about how EJ/injustice should be understood?

To provide answers to these questions, I further break down these overarching questions and ask other related sub-questions for the general agenda (some of which

then become specific questions in relation to my US and Taiwanese case studies):

- Can we identify, characterise, compare specific EJ frameworks?

- What assumptions and interests are embodied in these frameworks and the claims coming from them about the character and extent of environmental injustice?

- How have the different conceptions of EJ and the arguments about EJ/injustice interacted?

- How can and should these frameworks be criticised? How should we approach the measurement and explanation of environmental injustice and the implications of its analysis?

Deriving from these macro- and meso-questions, I further pose some specific questions for each case study. In the US case, it is clear that there are conflicts within research groups. My primary attempt is to extract the claims from each "wave" (see next chapter) and to unfold to what extent researchers deviate from each other. This includes the exploration of the nature of difference, what forms of difference take place, and how researchers explain EJ through different frameworks. Further, I investigate the role of science within the process of constructing EJ.

In the Taiwanese case, I assess how EJ was adopted in Taiwan. Part of the point of this thesis is to suggest that countries like Taiwan cannot entirely accept the EJ concept without re-contextualising it. Thus, which specific elements of EJ were chosen and what are the consequences of choosing these elements are appear to be significant questions. Finally, I address to what extent these chosen elements can be verified. The following outlines the points that will be brought into profound discussion in this thesis.

In the US case:

1. Is EJ explained differently by different agencies? Why do these differences arise?
2. Which "evidence" is challenged, and why?
3. What part does science play in the construction of EJ?

In the Taiwanese case:

1. How has EJ been adopted in Taiwan?
2. Which specific elements of EJ were chosen? Which were rejected?
3. What are the consequences of choosing these elements?
4. To what extent can the chosen elements and evidence verify their EJ arguments?

1.2.2 Data sources and source selection methods

1.2.2.1 Documentary sources

To reconstruct the history across a number of social areas, documents are applied to sketch the past transformation of EJ, and to predict future trends. As documents have overwhelmingly served as the backbone of this research, the selection of sources, their interpretation and their use will be driven by my research purpose. The primary documents are as follows: EJ regulations (including texts of proposed legislation, Executive Orders, Congressional hearing transcripts, and EPA dockets and guidance), legal precedents, white papers, EJ groups' published agendas, etc. These documents are weighed differently in each of the two case studies considered in this thesis: the US and Taiwan.

In the US case, considering its longer history and relatively richer literature, it is unrealistic for me to review all available materials. To avoid getting lost in the maze of documents, I select the most significant examples (case studies) within each "wave" of studies (what I indicate as secondary literature below) and review/comment on them. I then move into investigating the interaction among these

waves to clarify EJ's debates and its changing meaning. In my Taiwanese case study, I will closely follow the so-called textbook EJ cases. Given that EJ is still developing in Taiwan, official documents are relatively scarce. I will therefore call upon EJ groups' announcements and agendas to explore this case study.

In order to assure the quality of my sources, documents must be evaluated through some criteria in keeping with accepted historical research. Here, I would like to raise two primary concerns: the language barrier and electronic sources. The language barrier has long been a major concern in the field of EJ. Thank to EJ's successful campaigns[7], nowadays agencies, especially in the US, often prepare their documents in several languages to ensure the quality of public engagement. For instance, US EPA (2006) provides an English-Chinese EJ brochure to reach out to the Chinese population. Similarly, the Taiwanese government also provides some English documents for its foreign residents. For different reasons, English documents, whenever available, are selected as the major source in this thesis.

In the US case study, as I cannot speak Spanish, the second language of America, I have no choice but to depend on English sources, which invites an over-emphasis on the "Black" version of EJ. For this reason, other equally important viewpoints, especially those of Hispanics and Native Americans, may be underrepresented in my thesis where they are not translated into English. Despite the possible over-emphasis, it is still very meaningful to analyse this Black dominated debate as a lack of voices from other minorities itself shows the very fact that the EJ movement underwent a period of rapid expansion. EJ as a movement originated from the Black communities, expanding over time to encompass other minorities. Nowadays, Blacks and Latinos are attempting to strengthen their alliances; but these two groups are still struggling to come up with a convergent discourse for EJ (Bullard 2009a). Placing this into the larger historical context of EJ, it was here that I was best able to achieve a fuller

[7] One of the landmark cases is El Pueblo papa el Aire y Agua Limpio v. County of Kings (No. 366045 Cal. Super. Ct. Dec. 20, 1991). In this case, the court supported the plaintiff's claim that residents in Kettleman City, California, a farming community with a large Hispanic population, were denied meaningful participation because the public hearings and the environmental impact assessment report were in English only. The court then overturned the county's decision to allow a waste site to be enlarged. This case is often quoted as a triumph of EJ. See: (Cole 1994; Collin 1994)

understanding of how the traditional Black version of EJ fits in with other, ongoing forms of interpretation. In this light, these discussions will be taken as reflective of conceptual terrain in negotiation.

I will use English sources (where available) for researching the Taiwanese case study to avoid translation errors. These English documents were valuable to get a sense of how the Taiwanese government presents its policies to the international community. When using these documents, caution is necessary because it would be naïve to assume that these English publications constituted a uniform sample from all the original Chinese documents. For one, these materials often provide summary information only, and therefore their quality varies substantially in the level of detail available. For another, more often than not these English documents are not a direct translation from Chinese, but rather they are diplomatic propaganda. Comparing an English summary document with the original Chinese version, it is not uncommon to find the English version downplays some key information or rephrases fundamental statements into a softer tone. When this happens, I will caution my readers in a footnote.

The second concern I would like to address here is regarding the nature of electronic sources. In both the US and Taiwan, EJ gained its strength from practices of networking and alliance building among grassroots groups, academics, and individuals (Schlosberg 1999; Gleeson and Low 2003:459-463). These practices of networking moved EJ's reach from street-level protests to national anti-injustice commissions. This broadening of national, even global, networking is only possible because of the internet. Electronic copies of regulations, brochures, campaign information and many other documents are abundant online, and activists are heavily dependent on electronic sources. Websites, like the Environmental Justice Resource Center[8], are often cited in campaigns. Needless to say, EPA itself is very keen to digitise its regulations and publications[9]. Since electronic sources are widely used on the EJ front line, researchers must also use them as sources.

[8] See: http://www.ejrc.cau.edu/ .
[9] See EPA's National Service Center for Environmental Publications website: http://www.epa.gov/nscep/ .

For the purpose of this research programme, in general I do not treat online sources as of inferior quality. Instead, I view electronic sources as a way to gauge the information gap among various parties. I however do recognise a vast array of possibilities for document (mis)handling. Considering the easy-to-replicate nature of electronic documents, it opens a gate for endless opportunities for modification, revision, and even manipulation. More than that, information on websites is often in an abridged and non-technical form, which poses a special danger to researchers. For instance, EPA provides both technical reports and explanations for laypeople on its risk assessment portal[10]. This two-version design is both a blessing and a curse. The lay version offers easy access for activists; however, important details are often missing. Again, caution is necessary in using these sources of information. The researcher's best defence is to seek reliable websites and sources and to consult the original documents/reports to fill in the gaps between official and summary information.

1.2.2.2 Interviews

In this research, interviewing served as a secondary data source. Only a limited number of interviews were conducted in the Taiwanese case study. What I was looking for was to use the interviews to highlight the general themes around which there may be some different opinions. To this end, a range of interview methods were used, ranging from formal face-to-face semi-structured interviews through telephone/Skype interviews, to informal opportunistic discussions in the context of meetings and hearings.

[10] http://www.epa.gov/risk/index.htm

Table 1.1: Interview list

Institution	Position	Transcript/Date
Green Party Taiwan	General secretary	Taped (Skype interview) 19.09.2007
Lanyu Anti-Nuke Movement	Indigenous pastor/activist	Taped (Skype interview) 25.09.2007
Lanyu Anti-Nuke Movement	Indigenous scholar/activist	Notes (quick face-to-face discussion) 10.04.2008
Lanyu Anti-Nuke movement	Scholar/environmentalist	Notes (quick face-to-face discussion) 11.04.2008
Environmental movement	Scholar/environmentalist	Taped (face-to-face interview) 25.09.2007
Legislative Yuan (Taiwanese Congress)	Indigenous MP's assistant A	Notes (Off-the-recorder/face-to-face interview) 11.04.2008
Legislative Yuan (Taiwanese Congress)	Indigenous MP's assistant B	Notes (Off-the-recorder/face-to-face interview) 12.04.2008
Council of Indigenous peoples	Senior officer	Notes (Off-the-recorder/face-to-face discussion) 17.04.2008
Indigenous movement	Indigenous activist	Notes (Off-the-recorder/face-to-face discussion) 17.04.2008

Source: by the author.

Telephone interviews play a special role in this research for several reasons (Thomas and Purdon 1994). For one, it is often difficult to arrange lengthy interviews with high-ranking individuals, some of whom have been interviewed numerous times by others. More than often, I was told to refer to the interviewee's recollections contained in articles or hearing archives. Sometimes however, that same person may respond with a quick telephone call whenever suitable for him/her. In such cases,

instead of structuring a formal interview, I minimised my questions to keep the conversation short. It is especially worth noting that my funding body, the Taiwanese government, has a strict time limit for any traveling back to Taiwan and to countries outside UK, even for fieldwork reasons. This time limit deeply affected my data collection methods. As it was difficult to conduct on-the-ground fieldwork in Taiwan or the US (because of my PhD funder's travel restrictions), I can only use telephone to maximise my chance to interview.

A snowball sampling technique was used, that is, those having been interviewed were asked to identify other people they know who fit the topic of this research (Arber 2004:63). Luckily, my interviews started with the General Secretary of the *Green Party Taiwan* and a leading anti-nuclear activist from Lanyu. They are the leading actors who shape Taiwan's environmental movement. Regarding the contents of my interviews, I adopted a semi-structured approach, meaning that I do not restrict myself to a rigid set of questions to follow; instead, these questions are treated only as a conversational map. Since each person interviewed played a different role in the events at issue, I constructed different questions for each interviewee. Although different questions were asked, in general every interview was still revolving some pre-set key topics. In the course of my conversation, these key topics guided my prompting and probing questions, as applicable (Fielding and Thomas 2004).

Several interviewees, most of them activists, spoke strictly "off the recorder" of their bitter experiences struggling with the government. Under such circumstances, I had no choice but to jot down some key points as much as I could during or soon after our conversations. The quality of the field notes was variable. In many ways, I found the candour of these interviews more useful than any other forms of sources. One major finding is, although the long-lasting martial law has been lifted for decades, the shadow of White-terrorism (McCarthyism) persists. For post-martial-law generations, like myself, White-terrorism seems a bygone era but in fact the Taiwanese have not completely recovered from this trauma. No wonder President Ma asserts that reconstructing people's trust toward the government is the only way to achieve EJ (Ma 2008). In this light, these interviews proved useful in ways that I had

not anticipated, notably in enabling me to understand local context and concerns.

1.2.2.3 Secondary literature

Secondary literature reviews refer to a research method and critique of research conducted by other researchers. EJ movement and policies are deeply engaged in the contemporary treatment of environmental issues in terms of scientific analysis and argument. Secondary literature, often citied by EJ groups or even governmental documents as "evidence" (US Commission on Civil Rights 2003), plays an important role in shaping the movement of EJ. Accordingly, secondary literature is weighed as important as, if not more important than, primary documents in this research.

To some extent, EJ researchers and scientists carry authority of authorship for guiding EJ's direction. This is especially the case in the first-wave studies. Researchers, like Bullard, in this generation often played a key role in advocacy groups. However, it would be incorrect to think that they assumed this authority without challenge. In effect, the application of EJ was teeming with deviations, controversies and disagreements, and these form the basis for this research. In this way, secondary literature as written is itself a key source of information. This literature, on the one hand, provides us an important clue as to different actors' motivations and goals, and the issues most important to them at the time of their writing. On the other hand, the application of literature, i.e. who quotes what, when, and how, reflects the shifting thinking and changing priorities in the movement. From this perspective, literature functions as a baseline for us to understand how these actors justified their EJ claims.

As I position this thesis in the framework of STS, special attention is paid to social scientific studies rather than philosophical debates. Following this general research interest, I attempt to recognise which elements of a scientific finding are applied in a given situation, and how they are applied. A close inspection of this will reveal that the meaning and application of EJ is not something out "there" ready to be referred to. When a problem arises or a situation develops, all parties try to ensure their

argument is heard. The accepted argument then becomes in turn part of the basis for future meaning-shaping and concept application. In this way, we will come to witness the development and growth of a tension between the EJ movement and the EJ science. As we can see, activists rely on scientists to gather sufficient evidence so that they can make their argument. The process of evidence-finding is however long and slow, which considerably slows down the decision-making process.

In this thesis, we will witness this recurring tension from the very beginning of the EJ movement. In order to respond to this tension, all participants have sought to redefine the boundaries between EJ and science. In so doing, we will discover that the scientific standards used to assess the phenomenon of EJ turn out to be flexible and value-laden. In this sense, my work is very close to STS controversy studies (Mercer 1996; Messner 2008) which reveal the social relations within scientific activity. Although these social factors always exist in scientific activities, they are often obscured under several layers of routine practices.

1.2.3 Data reduction and analysis

This research adopts a triangulation of research tools. Triangulation is one of the central ways of validating qualitative research; it involves the use of two or more methods and sources to approach the same research question. By so doing, the researcher can build a more comprehensive inference to support his/her argument (Ritchie 2003).

This research used two primary forms of sources: documentary data (including secondary data) and interviews. Given the dissimilar nature of these forms, different strategies were adopted to triangulate my argument. The documentary data from the sources mentioned above were divided into three groups, one for each of the three waves. As interviews were only conducted in the Taiwanese case study, it serves as a supplementary source, meaning that this type of data was integrated with the documentary sources so that I can compare the concept of EJ “before and after” its import into Taiwan.

For this research, reduction and analysis of documentary sources involved a series of (electronic) note-taking, filing, and organising. With the help of EndNote and XMind, original documents and literature were assembled in a historical manner (according to the three waves), ready for comparison. In any documentary analysis, the biggest challenge for a researcher is to balance the tension between details and the bigger picture, which is related to the question of why some materials were chosen, and others were not. As there are so many sources available, it is impossible for any to include all information/cases. Moreover, even when analysing the same document, owing to their different training and backgrounds, analysts may come up with various interpretations or focus their attention on dissimilar parts of the documents (Messner 2008). My strategy here, as mentioned, is to address my arguments through some leading cases, or through the so-called text-book cases. Of course, one might further ask which cases are typical enough to be chosen as leading cases. Clearly, this is a judgment that the author has to make.

Regarding interviews, they were recorded digitally, transcribed and coded, except where my interviewees requested otherwise. Analytical categories will be generated by the methods of coding (Blaikie 2000; Spencer, Ritchie et al. 2003). Again, as interviews were primarily used as a corroborative source to the documents, their analysis involved a comparison between documents and interview materials with respect to the research questions mentioned above.

1.2.4 Some reflexive considerations

1.2.4.1 Whose side am I on?: Analyst's position

When I was analysing my interviews, I also took opportunities to present portions of my work at conferences and then to submit them to journals (Hwang and Huang 2007; Huang and Hwang 2009a; 2009c). I found myself embroiled in the debate of "whose side are we on?" (more specifically, "whose side am *I* on?") (Becker 1967). This question arises because a researcher can take up different analytical positions and thereby he/she directly or indirectly help (or not help) one side or one

participating group. This issue poses a special challenge in EJ research as my case/interviewee selection itself establishes me in a pre-given context, which invites criticism from both sides. EJ activists found that I was *not* on their side, as I showed little emotion or passion during my interviews and in my following analysis. They argued that I should not even give "airtime" to EJ critique because by taking this critique seriously I implicitly aligned myself with *the other side*. EJ critics however argued that my case/interviewee selection reflects nothing but an uncritical *pro-EJ* attitude. That means, although I did not explicitly show which specific versions of EJ I support, I am definitely on the side of pro-EJ, which may impinge on the credibility and impartiality of my research.

If only I had first read Burningham and Thrush (2001a; 2001b; 2003), I could have better explained this "research for, or research on" debate. According to them, it is important that researchers are willing to give something back to the disadvantaged groups who helped in the research. They argue that researchers should conduct research *for* their subjects, and not just *on* them. That is, my research subjects should at least in some way benefit from my study (see below). This is especially true for those who are investigating environmental concerns or disadvantaged groups (Burningham and Thrush 2001b:186-187). In a word, a researcher should *not* hide behind the banner of dispassionate observation whilst the disadvantaged communities benefit nothing from the research.

Again, to the question of "whose side am I on" there is no right or wrong answer and it should not be interpreted as a dichotomy that I am "either with EJ or against EJ". However, as I am conducting a research on environmental "(in)justice", it seems unthinkable *not* to choose the disadvantaged side of the story as a *starting point*. Given that many of the EJ events I would hope to study took place in a specific area (say, Lanyu) or a pre-given social setting (say, the environmental movement), selection of interviewees and sites was constrained by the inevitable combination of few people/sites. Sometimes only limited data are available, pertaining to a small number of sites or a handful of people. Such limited data can nonetheless offer valid results provided that the analysts supply sufficient detail to place it in context.

Looking at data in context, I believe that my original research questions can still be answered, which makes my whole argument meaningful. Surely, it is the reader, instead of the author, who can decide whether sufficient contexts have been provided. I leave it to my reader to make his/her own judgement.

1.2.4.2 Research limitations and other ethical concerns

The case study as a qualitative research method is often criticised for its inability to generalise to wider populations or to other similar cases. Some agree that this method provides fruitful in-depth data for a specific case; it is however less useful in constructing a covariant casual model. Meanwhile, others assert that although a case study cannot contribute to statistical generalisation, it can lead to analytical/theoretical generalisation (Gerring 2004; Yin 2008). Issues about generalisation pose a special difficulty to my research, as it is the very point on which my recent publication has been challenged (Huang and Hwang 2009c). In that article, both referees agreed with my argument that whilst EJ in the US context is concentrated on the provision of statistically generalised evidence, in Taiwan it is a case-by-case judgement. In this light, Taiwanese and Americans are *not* talking about the same EJ. While I correctly pointed this out, they indicated that my "case study" itself fell into the second category, and therefore a generalised EJ picture in Taiwan is still to be painted.

My best defence is that it has *not* been my desire to make a wholesale generalisation; instead, my goal is to provide a context-based case, sometimes using extrapolation, to highlight EJ's claim-making. It is *not* my intention, either in this thesis or that article, to prove whether the chosen case is an occurrence of injustice. Rather, what I did was to demonstrate that EJ can mean different things to different people. I fully acknowledged that it is very difficult, if not impossible, for me to attain a comprehensive understanding toward EJ from which exact conclusions are drawn. What I could do is to examine how EJ claims fit within a wider set of concepts. By so doing, this research opens an opportunity to define, revise, or reject the theories that we have long taken for granted.

In respect of ethical concerns, given the uncontroversial nature of documentary and secondary data, this research is in general *not* ethically sensitive (Grinyer 2009). Where there are ethical concerns, they arise from interviewing. Again, I have to remind my readers that interviewing for this study was relatively limited. In all interviews I followed a set of procedures to review the ethical accountability of my research (Bulmer 2001; Grinyer 2002; 2009). For instance, before conducting each interview, I requested permission from my interviewees to record. In the course of my interviews, I offered all my participants an option to remain anonymous in publications and presentations. After the interview, they were also offered the chance to review or clarify my transcripts.

One special ethical concern in this research was partly the result of the above-mentioned "research for, or research on" debate. To this debate, it begs the question how it is "for" someone. Surely, this question itself is subject to criticism and challenge. More than often, my interviewees expected me to provide a channel for disseminating the *reality* of environmental injustice to a broader audience. To some extent, I was doing just that as my project clarified the ways EJ was shaped. In this way, a broadening understanding of EJ was the very thing I gave back to the EJ communities. In this light, I am research *for* my subjects. Nonetheless, for those who expect me to *prove* the harsh reality of how unjust Taiwan is, I am afraid that their expectation cannot be met through my research. In both cases, I need to constantly be reflexive.

1.3 Plan of thesis

This thesis focuses on what EJ means in practice and how EJ is constructed. To this end, two major case studies will be closely investigated. Chapters 2 to 5 present a detailed account of EJ's recent history in the US, from the Warren case in the 1980s almost up to the present. The US case study demonstrates the development and consolidation of the procedures and standards for testing EJ. These chapters provide the basis for understanding differences in discourse between the US and the

subsequent Taiwanese case study. Looking at when, where, and with what meaning EJ is deployed provides us with new insight into the ways through which EJ has been adopted in Taiwan. As we move into the empirical material of the following chapters, I will seek to make some observations regarding different research stances within the literature.

Chapter 2 gives an empirical historical account of the US EJ movement. In this chapter, we will see the beginning of the EJ argument and then witness the fact that although the term environmental justice has been widely accepted, there is a lack of general consensus about what it means. The 12898 Executive Order illustrates just that. This Order required that all federal and federally-funded projects assess their social impacts. Because of it, EJ gradually made the transition from street-level struggles to a legal commitment which could hold its ground against a barrage of challenges to its authority. At first glance, the institutionalisation of EJ represents a major success. In fact, after reaching its high-water mark, EJ may now "be entering the most difficult phase of its early history" (Goldman 1996:126). In the aftermath of this Executive Order, neo-liberalists, positivists and EJ proponents were struggling for the definition of what EJ should really mean in practice. One result of this struggle was a new set of definitions of EJ. Instead of providing a traditional form of literature review, hopefully this brief description of different stances toward EJ gives the reader a sense of theorists' major concerns and the approaches they tend to take to the subject.

Chapter 3 moves us into the politics of definition. While this elaborate language game is often thought of as secondary, I argue that because certain definitions are inclined to support a particular value judgement and policy choice, contests over semantic nuances are themselves a policy debate. After the 17 Principles of EJ were adopted by the First National People of Color Environmental Leadership Summit in 1991, it is more than obvious that the focus of EJ has transcended, without abandoning, its original focus over race to include other concerns, such as class, gender, and non-humans (Cutter 1995a; Gleeson and Low 2003). The scope of EJ seems to be creeping continuously outwards, encompassing new issues and more

people. I argue that there is no way of resolving all situations from all perspectives by one single, all-embracing concept (Davy 1997). Behind this tale of widening reach, the EJ rhetoric is constantly defined, contested and then redefined. This chapter examines three competing EJ terms in depth, showing how processes of practical consensus can mould, and sometimes distort, our understanding of this concept. Also, we will see how key EJ terms have changed in meaning or became conceptually unstable in response to political opposition.

Chapter 4 is about the "traditional" spatial approach for testing EJ claims. While activists assert that the evidence of injustice is mounting, it is instructive to investigate what types of research were being conducted and how opponents sought to debunk the EJ thesis from methodological and philosophical grounds. In this chapter I argue that EJ is not a static phenomenon putting itself out there for observation, description, explanation, and treatment. Indeed, researchers and analysts, by examining EJ are, to a large extent, also constructing EJ facts. After three decades of EJ research, scholars now cannot even agree on basic issues like what and where EJ communities are, or how to measure them. The field of study is still bitterly divided. As these technical debates in turn affect EJ's present politico-theoretical compass, we must not overlook them. By analysing EJ research in detail, we will see how the philosophical understanding of "justice" has broken up; giving way to, and making room for scientific understanding of justice in the form of calculation and measurement (cf. Gleeson and Low 2003; Rhodes 2005). It is evident that even in the context of EJ, an area often viewed as rigidly norm-guided, justice turns out be much more "scientific" and adaptive than often believed.

Chapter 5 scrutinises the developing risk-based approach in understanding environmental injustice problems. In the traditional approach, the relationship between risk and proximity was simply assumed. As a result, risk is a relatively unfamiliar term in the field of EJ. After its institutionalisation, it is no longer sufficient for a researcher to base his/her argument on such an assumption. As large amounts of compensation and remediation works are involved, all parties agree that further evidence is needed, leading to the creation of a risk-based EJ approach. At

first, it seems harmless, even beneficial, to have a more comprehensive way of testing EJ. After all, no one could possibly claim that accurately assessing risk is not, at least in part, the goal of EJ research. This chapter demonstrates that when the concepts of EJ and risk start to converge, outcomes are in no way a straightforward output of activists' or scholars' wills. The danger is, risk assessment will inevitably bring its own methodological and philosophical baggage into EJ research. Given that risk assessment is itself contentious, combining these two approaches invites even more complicity. Gradually, I argue, research may become a goal in and of itself, rather than a means to ensure the achievement of EJ. This chapter demonstrates that as soon as the concept was institutionalised, higher standards of accuracy were imposed on its applications. However, meeting new standards of accuracy would considerably increase the time and cost of analyses, which ultimately undermines the principal basis of EJ.

Chapter 6 takes us to the story about EJ's export from the US to Taiwan, discussing in detail how EJ was brought to bear on new situations. Two cases are chosen specifically because they were the first two applications of EJ in Taiwan. I will argue that the Taiwanese version of EJ is in fact very different from its US counterpart, and that Taiwanese activists and scholars do not seem to acknowledge this fact. Concretely, in order to tailor EJ to local contexts, much effort has gone into modifying the meaning of EJ such that Taiwan's cases show a strong tendency of "racialising" EJ issues and activists accept a case-by-case approach (Huang and Hwang 2009a; 2009c). As EJ means so many things, it puts obstacles in the way of local activists trying to promote EJ. For some, they may argue that the substantive meaning of EJ is supplied by what it "includes", not by what it excludes (Schlosberg 1999; Gleeson and Low 2003:462). In this way, a broader conception of EJ is favoured. The problem with that is, with such an expansive definition, one could easily come to a claim that the status quo itself has been justice enough, and therefore no changes are needed. President Ma introduced a "Sustainable Taiwan" policy which demonstrates exactly this challenge. His administration is arguably one of most pro-EJ but activists still sharply criticise his policies for overlooking justice perspectives. Clearly, contested conceptions of EJ may be read from this contention

and I attempt to unpack just that in this chapter.

In the final chapter, I will bring the entire story together, drawing conclusions designed not only to demonstrate the constructive nature of EJ, but also to expand the applicability of my findings in thinking about the relationships between justice, science, and policy-making. In so doing, I will also draw some tentative conclusions about how the current positivist EJ approach could benefit from my research. A chief conclusion will be that most previous theories and studies of EJ simply *label* some cases as EJ concerns as if EJ is a steadfast phenomenon ready to be observed and measured. After EJ was institutionalised, this is especially the case. Now, researchers seldom ask the fundamental question of what constitutes EJ. For most of them, EJ is simply a routine set of practices and scientific measures which say nothing about the scope and complexity of EJ. Over time, scholars' efforts to make EJ science have removed EJ from its social contexts. I will argue that the constructive perspective provided in this thesis offers an alternative basis for understanding EJ, and will provide the foundations for an alternative set of policies to realise it.

2 A history of EJ: A conceptual analysis

2.1 Introduction

In this chapter, I will briefly outline the history of EJ. Instead of analysing EJ's history through a traditional approach, I adopt the idea of classifying the history of EJ into three waves. Research activities are assigned to the same wave on the basis of their similarities in terms of scales of analysis, statistical methodologies, and most importantly their common focus. These three waves have emerged generally in sequence so that we can easily identify their high-water marks. Some scholars (for example Lester, Allen et al. 2001; Williams 2005) also use the term "wave" as a way to categorises the variety in EJ studies. In most first and second wave cases, our classifications are approximately the same since these waves are in sequence. In some specific cases, mainly the third wave ones, their classification is different from mine. Most scholars have only two waves. Thus, the third wave cases were put into the second wave in their categories. I attempt to indicate that it is dangerous to conclude that our waves resemble each other in a fundamental sense. When observing only the results of our classifications, it is easy to come to such a conclusion. What should be noted is that their cases are being classified on a different basis from the one I use. I separate the third wave research for two reasons: First, to highlight EJ research's shifting tendency toward decision-making processes, especially after EJ's institutionalisation; second, to demonstrate a clear focusing on methodological changes between each wave. The third wave research is new and still developing. Needless to say, the case number in this last wave is relatively smaller. However, an apparently radical change can be identified in both focus and methodology.

2.2 First wave: Political movement gains momentum

The EJ movement did not emerge until the early 1980s. Nearly all observers agree

that the EJ movement can trace its origins to 1982 in Warren County, North Carolina, when residents from the county and adjoining counties were protesting against the site of a landfill for a hazardous waste, polychlorinated biphenyls (PCB). As Warren County was the poorest county, with one of the greatest proportions of African Americans in the state, many of the protesters were convinced that this site was purposely chosen to take advantage of the community's lack of political power. The protestors believed that this landfill would be as much a violation of residents' civil rights as a threat to public health and environmental quality (Ringquist 2006:251).

Although the Warren County protest failed to halt the operation of the landfill, it raised awareness of inequity in environmental matters across the United States. Several empirical researches have focused on the relationship between commercial hazardous waste treatment, storage and disposal facilities (TSDFs) and the demographic characteristics of their surrounding areas. At the request of a Democratic Representative, Walter E. Fauntroy (District of Columbia), who was an advocate for Warren County, the US General Accounting Office (US GAO) started to take action (Washington 2004:62ff). The US GAO selected four large hazardous offsite landfills[11] in south-eastern states (EPA Region IV) and collected the racial and ethnic data within a radius of four miles. This research showed that, in three of the four chosen samples, Blacks made up 52%, 66%, and 90% of the population. However, within the states as a whole there is only 22%-30% Black population. Additionally, between 26% and 42% of the populations adjoining the sites lived below the poverty line; these states in general only have 12%-19% of their population living below the state poverty line (US GAO (U.S. General Accounting Office) 1983). As GAO has stressed, the aim of this study 'was to determine the correlation between the location of hazardous waste landfills and the racial and economic status of surrounding communities' (US GAO (U.S. General Accounting Office) 1983:2). Evidently, the US GAO report revealed the correlation between waste sites, race and income.

In the mid-1980s, quantitative research was conducted on a national scale in the

[11] Two of the four facilities apparently were commercial TSDFs; the other two were landfills.

United States. The researchers asked "Are some groups disproportionately exposed to toxic wastes?" The United Church of Christ's Commission on Racial Justice[12] (UCC) conducted a national study on environmental equity. This benchmark study identified itself as "the first national report to comprehensively document the presence of hazardous wastes in racial and ethnic communities throughout the United States" (United Church of Christ 1987:ix). The UCC study examined the locations of 415 operating, and 18,164 closed commercial hazardous waste facilities. This study documented strong racial and ethnic biases in exposure to toxic wastes on the national level, and concluded that race has been the determining factor in deciding the location of the hazardous waste sites, more so than class. Since "race proved to be the most significant among variables tested in associated with the location of commercial hazardous waste facilities" and "this represented a consistent national pattern" (United Church of Christ 1987:xiii), UCC urged the US EPA to give high priority to cleaning up where waste sites are in minority communities. They also called for the President's prompt actions to issue an Executive Order improving environmental equity and to establish an Office of Environmental Equity within the EPA.

The UCC methodology, comparing census data arranged by five-digit "zip codes", became the standard for many future studies. More specifically, the UCC research identified target waste treatment sites first, and then collected demographic and income data from the most recent census for the zip-code areas where those sites were located. Lastly, the data gathered was compared to data from areas where there were no waste facilities. The UCC report assumes that those most exposed to hazards are those who live nearest to the plant site[13].

Seven years later, UCC updated their data and published a revised report (UCC Revised). Strikingly, their report demonstrated that the situation in 1994 for

[12] The UCC believes that it is their "call for conservation and development of the Earth's resources for the benefit of all people now and in the future". As the result, from the day it was founded, the UCC has been very keen for EJ to happen. Thanks to UCC Reverend/Director Benjamin Chavis's effort in Warren County, environmental racism has become a national concern. Incidentally, it is believed that Reverend Chavis was the first person using the term "environmental racism". More details can be found in their website: http://www.ucc.org/justice/environmental-justice/

[13] I will discuss this thoroughly in next chapters.

minorities had become even worse than 1987. The percentage of minority groups sharing zip codes with hazardous waste facilities rose from 25% in 1987 to 31% in 1994. Although it would seem that minorities have become even more likely to live close to the plant site over the previous 7 years, this revision also showed that the average percentage of minorities who live in areas where new hazardous waste facilities have been sited has declined from 52% in the 1950s to 33% in the 1980s. Therefore, the percentage of minorities living near newer facilities is lower than the percentage of those living close to older facilities. The report's authors consider that this upturn derives from new siting initiatives (Goldman and Fitton 1994).

The methodology used in the UCC study has been confirmed by numerous other studies examining the issue from various perspectives. After the UCC's study, other quantitative studies began to focus on different jurisdictions, such as cities or states. Generally, all the literature reflects one thing: minorities and the poor were apparently more likely to be exposed to environmental risks than were White and well-off people. Although literatures showed that not only communities of colour but also low income groups are disproportionately bearing the brunt of exposure to toxins, activists or experts in the first wave period still only chose race, rather than income, as their campaign priority. "Stop environmental racism"[14] rather than "Stop environmental injustice" became the slogan for asking government to take actions against the racist waste-site decision (Williams 2005). Pulido (1996) called this phenomenon of campaigning in a racial sense, rather than others, "racializing environmental hazards":

> It is still unclear why racism has been so much more forceful than, say, an emphasis on equity, which would include whites. Certainly one factor is the authority and organizational capacity of the civil rights establishment. But perhaps more important is the degree to which "race" looms large in the public consciousness and it is no longer acceptable to engage in what the dominant society deems racist behavior (i.e., deliberate targeting). In contrast, income disparities and political weakness emanating from class relations are rarely, if ever, critically discussed. (Pulido 1996: 145)

[14] Another reason activists chose environmental racism rather than income is because racial discrimination is illegal while other forms, say economic discrimination, are not. About the legal debate, see next chapter.

Another crucial figure helping to shape the dimensions of environmental racism was sociologist Robert Bullard, also known as the father of EJ. In 1979, at his lawyer wife's request, Bullard conducted a study on the spatial location of municipal landfills in Houston, Texas with the purpose of offering data for a lawsuit (the *Bean* case[15]) that she was arguing. In this research, he confirmed that in the area surrounding the waste facilities, Black and Hispanic residents are most likely to be found. He then wrote a series of articles from 1983 (several co-authored with Beverly Wright) and his widely cited book, *Dumping in Dixie* (1990). He documented that these environmental disparities occur not only in Houston but in the US as a whole. Taking one step forward, his work provided the mobilisation of the EJ movement by proclaiming that minorities also have the basic rights of all Americans, 'the right to live and work in a healthy environment' (Bullard 1990:43). Being a member of President Clinton's Transition Team[16] and later an advisor in the National Environmental Justice Advisory Council (NEJAC), he has become a representative of the EJ movement (Hannigan 2006:49-51; Bullard 2009b).

2.3 Second wave: Conflicting evidence and authority

The first wave of research did not remain unchallenged. After paying attention to differential units of analysis[17], a growing number of statistical and historical researchers has started to disagree about how best to measure and represent environmental inequities across space. From the 1990s, researchers from a historical point of view have set up a new process-oriented approach with the aim of disclosing real patterns of geographic associations between pollution/waste sites and income/minority communities. In opposing former researchers' claims about the correlation between race and exposure, second wave scholars questioned whether the observed patterns really existed, and even if those patterns do exist, should they be

[15] About *Bean*, see next chapter.
[16] The transition team is responsible for ensuring that the transfer of power from the current administration to the President-Elect is smooth and that the continuity of leadership is preserved.
[17] In next two chapters, I will investigate the debate on scale/units of analysis in depth. Thus, I will not go into details here.

categorised in a racial or income context? Moreover, "which came first", the facilities or the Black (and the poor)? The strategy of this new wave research is to scrutinise previous researches. Several first-wave landmark researches have become the targets of criticism.

The UCC case was challenged in a comprehensive study published by researchers from the University of Massachusetts's Social and Demographic Research Institute (SADRI) (Anderson, Anderton et al. 1994; Anderton, Anderson et al. 1994). After reanalysing the data employed in the UCC study, SADRI found that if one alters the geographic units of analysis from zip codes to census tracts, the results vary as well. Their striking finding is that after changing units of analysis to a smaller unit, census tracts, the UCC-affirmed statistical significance between minority populations and noxious facility sites disappeared. They asserted that evidence of racial and ethnic bias in the location of hazardous facilities is almost non-existent[18]:

> [N]o consistent national-level association exists between the location of commercial hazardous waste [facilities] and the percentage of either minority or disadvantaged populations. (Anderton, Anderson et al. 1994:7)

Failing to explain their choice of scale is not the UCC report's only worrying problem open to criticism. Researchers have also criticised the UCC for overlooking Federal and State regulations' profound impacts on the commercial hazardous waste industry. That is, UCC did not provide a historical overview on the changing demographic makeup of host communities, but showed the demographics of their chosen period only. Concretely, there were no federal standards for hazardous waste facilities until the US Congress passed the Resource Conservation and Recovery Act (RCRA) in 1976. Four years later, EPA started to regulate waste facilities; without a doubt, this federal regulation did change much of the siting behaviour. In effect, since EPA's regulatory activity standard, the total amount of siting has not proliferated but

[18] It is worth noting that the UCC soon fought back by accusing SADRI of manipulating data and accepting a sponsorship from WMX Technologies. One of the UCC authors argued that an expert community funded by government and industry is likely to result in regressive results (however, he did not analyse whether it is valid for receiving money from a church as he did). No matter these accusations towards SADRI are true or not, SADRI has successfully demolished UCC's argument and credibility. More fully see: (Goldman and Fitton 1994; Goldman 1996)

been on the decline[19]. If the number of facilities had been decreased, then the UCC research might only show the current incident but not the "original" bias when the facilities was sited.

Ignoring the crux of these regulations' impacts, the UCC report chose the 1980 census information as their starting point. Because many sites started operations in the early 1970s or even earlier, McDermott (1994), Director of Government Affairs for WMX Technologies, argued that data from the 1970 Census would provide a much more accurate demographic picture of the community at the time of the pollution. Also, he stressed that in order to analyse the racial composition of the communities at the time the siting decisions were made, the demographic data should be taken from resources as close to the time of siting as possible. In sum, discriminatory intent is presumed in the UCC report and by selecting data collected from different times, it is possible to approach the UCC report in a different way.

Supposing that the UCC report is useful in describing where the operating facilities are located at a national level, it still tells little about a specific case at local levels. Using exactly the same methodology, i.e. 1980 census data and zip codes, the WMX conducted their own study on 130 WMX-owned disposal facilities. This study however found that 76% of its facilities are located in communities where the White populations are equal to or greater than the host state average (McDermott 1994:697).

Another well-known challenge comes from Been's series of studies (1994a; 1994b; 1994c; 1995), which also contested earlier claims about the correlation between race and exposure. Similar to the SADRI case, Been singled out two previous first-wave researches, one conducted by GAO and the other by Robert Bullard. Both of these cases centred on only one particular region. Bullard's 1983 work looked at existing landfills and incinerators in Houston. The GAO case inspected the demographics of areas around four landfill sites in Alabama, North Carolina, and South Carolina.

[19] EPA's action in implementing RCRA was to establish an interim status program. Under this program, facilities in operation could continue their business until the final permitting standards are developed. Temporarily, thousands of facilities received interim permits. However, only roughly 160 facilities received their final permits, and the rest have been simply shut down. As a result, the waste management business is decreasing (McDermott 1994; Seigler 1994).

Contesting Bullard's statement, she argued that Bullard's research double-counted several sites and provided no description of how the neighbourhoods surrounding the sites were defined. After excluding all these errors, only ten of Bullard's 25 selected sites remained. Double-counting greatly damages the reliability of Bullard's research, according to Been. Not only that, she also noted that some sites where Bullard referred to could be traced back to 1920, and that some of them had ceased operations during the 1970s. These closed sites, she insisted, should be excluded from Bullard's research.

In addition to criticising Bullard's work, Been established the process-oriented approach. Instead of utilizing zip codes as units of analysis, city-block based metropolitan tract data were adopted for data collection. More importantly, by examining migration patterns, Been compared 1990 Census data for one specific area with 1980 or earlier data to distinguish what the demographics of the area had been when the facilities were sited there. She concluded that the outcomes of injustice might result from low housing prices. To put the matter simply, from a historical viewpoint, facilities now located in minority or low income areas may not have been sited in these areas in the beginning. In several instances, people of colour moved into the polluted areas ("coming to the nuisance[20]" in her words) because property values there were much lower than other places, and before Black people moved in, those communities had been White and economically diverse:

> By failing to address how LULUs [locally undesirable land uses] have affected the demographics of their host communities, the current research has ignored the possibility that the correlation between the location of LULUs and the socioeconomic characteristics of neighborhoods may be a function of aspects of our free market system other than, or in addition to, the siting process. (Been 1994a: 1390)

Adopting this historical comparative approach, she stressed that the poor or the colour residents living in areas hosting these undesirable facilities came to the area *after* the facility-siting decision had already been made. Surely, these arguments

[20] The disagreement between Bullard and Been is also called the "chicken-and-the-egg" or "which came first (Blacks or facilities)?" debate. See: (Bullard 1994d; Pastor Jr, Sadd et al. 2001; Mohai, Pellow et al. 2009)

implied that, although the present day risks from those sites may be distributed unevenly, the process of deciding on site locations was *not* discriminatory:

> As long as the market allows the existing distribution of wealth to allocate goods and services, it would be surprising indeed if, over the long run, LULUs did not impose a disproportionate burden upon the poor. (Been 1995: 41)

On Been's examination of whether market dynamics were the cause of present-day disparities in income and race, she found that market dynamics were not the dominant influence in the GAO case[21] (Been 1994a:1389ff.). Yet, in Bullard's Huston case market force played a significant role. She affirms that there was no correlation between the facilities' siting and the racial composition of the local population. What happened is that minorities or low-income groups moved in "after" the facilities had been located (Been 1994a:1400ff.).

Needless to say, Bullard contested Been's findings, and struck back by saying that the:

> historical record is clear, Black Houstonians did not follow the garbage dumps and incinerators--the waste facilities moved into established African American neighborhoods. The racial character of Houston's African American neighborhoods…was established before the waste facilities were sited. (Bullard 1994b: 460)

Bullard concluded this is because many of Houston's Black neighbourhoods were already established before 1950 and because facility locating disparities in Huston predate 1950[22]. Been's reanalysis had omitted some facilities and had failed to recognise concentrations of minority populations in closest proximity to the sites. In a word, he stressed that her historical data were not complete enough to draw her preferred conclusions (Bullard 1996).

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[21] In effect, the very opposite is the case, that is, after the facilities were established, the percentage of Black residents had decreased. In other words, Whites had moved-in, the phenomenon of White flight did not happen in the GAO case.

[22] Another noteworthy point is that most of the facilities and African-American neighbourhoods, according to Bullard, were established before the invention of census tracts. As a result, it is improper to choose census tracts as units of analysis. See: (Bullard 1994a).

After Been's study, debates arose and scientists started to question the actual scope of environmental inequity as well as the causal mechanisms that led to the inequity, rather than focusing on the facts of unequal exposure (Boerner and Lambert 1994; Coursey, Geer et al. 1994; Baden and Coursey 1997; Lambert and Boerner 1997; Huebner 1998). Her research also clearly demonstrates the fact that assessments of the distribution of environmental risks are easily affected by the choice of spatial units of analysis, data selection/collection/analysis, and statistical significance.

To be precise, the process-oriented approach argues that unequal burdens experienced by one group might be caused by prejudice or market forces. If the disproportionate distribution results from *intentionally* prejudiced behaviour in political processes when the sites were decided, it is an injustice on any definition. However, this approach implied that if the injustice is caused by socio-economic dynamics, it is hard to conclude that there is discrimination by observing only the consequences of inequity[23]. As Weinberg (1998) claimed, after environmental sociology has produced a tremendous stream of research pertaining to EJ issues, future research requires a radical shift in methodological approach. The central claim of EJ should be about the causality of exposure, *not* the fact of exposure. This wave's argument can be summarised:

> The issue posing the greatest difficulty in environmental justice research is which came first? Were the LULUs or sources of environmental threats sited in communities because they were poor, contained people of color, and/or politically weak? Or, were the LULUs originally placed in communities with little reference to race or economic status, and over time, the racial composition of the area changed as a result of white flight, depressed housing prices, and a host of other social ills? In other words, did the residents come to the nuisance or was the nuisance imposed on them (voluntarily or involuntarily)? (Cutter 1995: 117)

[23] The arguments between Been and Bullard happened not only in the past but also in latest incidents. After the Hurricane Katrina, commentators continually stressed that the abandonment of the residents in New Orleans were a function of class, rather than race, since most middle class Blacks left the city while poor Whites remained. As occurred before, this argument implies it is more acceptable to abandon people because of socioeconomic status than because of their skin colours. See: (Gauna 2005).

2.4 Third wave: Institutionalised EJ

Even now, outcome and process approaches still cannot reach consensus about whether the observed patterns of unequal exposure to environmental hazards should be interpreted primarily in racial or income contexts (Pastor Jr, Sadd et al. 2001). To a degree when the US EPA established the office of "Environmental Justice", the implication of having adopted the broader term *environmental justice*, including the poor and minorities, is obvious. According to the EPA's official definition, EJ becomes a matter identified by scientific knowledge, especially when it comes to determining so-called "EJ communities":

> The goal of environmental justice is to ensure that all people, regardless of race, national origin or income, are protected from disproportionate impacts of environmental hazards. To be classified as an environmental justice community, residents must be a minority and/or low income group; excluded from the environmental policy setting and/or decision-making process; subject to a disproportionate impact from one or more environmental hazards; and experience a disparate implementation of environmental regulations, requirements, practices and activities in their communities. (cited from Holifield 2001: 80-81)

Within this institutional discourse, EPA has affirmed that income as well as race constitutes the conception of EJ. Not only that, EPA has also shifted the research question into a new direction. Rather than analysing whether some communities bear environmental burdens disproportionately, the EPA's definition now aims to determine which communities face higher environmental hazards. Needless to say, the only way to identify those communities is to apply scientific measurement. Thus, demarcating "environmental (in)justice communities" has become a matter for scientific and technical analysis (Holifield 2001).

After institutionalising the concept of EJ, some more questions arise. First, analysing the EPA's definition, it implies that EPA's administrators somehow consider that it is possible to distinguish such communities after conducting scientific assessments. By accepting a broader definition, EPA seemed to harmonise the contentions between income and race viewpoints within EJ. In fact, scientists continue to interpret the

conception of EJ in different ways and cannot reach consensus even on what the term means and whether environmental injustice exists in the first place.

Another question is what forms of policy should be undertaken in order to respond to the finding of inequity? As Bullard (2000) has pointed out, polluters have the tendency to seek *the path of least resistance*. In other words, polluters always intend to find a minimal-cost place as their dumping sites. Because of a lack of social capital, it is hard to mobilise resistance movements in those marginal communities. In this respect, a necessary policy response is to empower marginal groups who have been excluded from conventional participation and decision-making processes. In order to empower those marginalised protestors, government need to properly inform those communities potentially to be exposed to sources of risks. Also, the reformation of participatory mechanisms to allow and ensure minority groups' equal opportunity of participation is significant. Research (Walker, Mitchell et al. 2005) argues that these goals could be accomplished by extending the function of Environmental Impact Assessments.

> With charges of racism, discrimination, and social negligence being bantered [sic.] about, discussions of the environmental justice issue are often passionate and, occasionally, inflammatory. Behind the emotion, however, two critical questions arise: Does the existing evidence justify such a high-level commitment of resources to addressing environmental justice claims? and What reasonable steps should society take to ensure that environmental policies are fairly enacted and implemented? . . .Before approving additional regulations on facility siting and permitting, policymakers would be well-advised to candidly assess both the quality of the existing environmental racism research as well as the likely costs and benefits of proposed solutions to this problem. (Boerner and Lambert 1994:1-2)

With the shift in concentration that has occurred since 2000, a budding "decision-making" approach has been advocated by William Bowen (2001; Bowen and Wells 2002; Bowen, Atlas et al. Online First). By asking "what is appropriate empirical evidence which can be used in decision-making process", the conclusions of what we might call the third wave of EJ researches stand in contrast to those of the two former waves.

Bowen reviewed 42 empirical research projects spanning three decades. On the basis of how well they meet "reasonable scientific standards", he categorised these studies as being of poor, medium, and high quality, and then argued that only high-quality research[24] should be considered by policy-makers[25]. After evaluating all 42 articles, he concluded that contrary to prevailing opinion in the EJ movement, there is no clear, statistically significant nationwide pattern of racial or ethnic discrimination in the location of hazardous sites. He stressed:

> If any such pattern can be discerned, and this is questionable, it appears to be that hazardous sites are located in the white working-class neighborhoods with residents heavily concentrated in industrial occupations, living in somewhat less expensive than average homes. (Bowen 2002: 11)

Moreover, although he agreed that high-quality research did indicate the possible presence of patterns at a sub-national level, since the empirical foundations of EJ remain under-developed, little can be said with scientific authority. He warned that decision-makers should recognise the high level of uncertainty regarding the existence of geographical patterns of disproportionate distribution and their health effects on communities made up of minorities, people with low income, and other forms of disadvantage.

Furthermore, Bowen appealed, on the one hand, for more empirical research studies to be done in order to build a scientifically more acceptable empirical foundation for decision-making. On the other side, he attempted to distinguish theoretical research,

[24] With respect to high-quality research, Bowen indicates that it was sufficiently well designed, conducted, and documented to likely be substantially accurate. However, the research in the high-quality category, he insists, also has flaws. This research should only be considered as "essential" to related environmental policy, because high-quality here means that it has reached at least the "minimum" level of scientific standards.

[25] Here a key issue is: Can one separate assessment of the scientific quality of research from its impact on the policy outcome? Normally, the answer is probably no. However, for the third wave scholars, EJ is one such an example. For instance, Bowen called the UCC case a "gray" study, for the reason the UCC study was published in a "church" journal. Without scientific peer review, Bowen argued, its scientific validity could not be ascertained. As a grey study, the UCC was accused of relying on popular opinion to validate its theory while ignoring the opinion of true scientists. This issue is related to EPA's "Aiming before we shoot" policy and the Data Quality Act. I will explore these policies in my "risky business" chapter.

including case studies, anecdotes [26] and so on, from those researches with a "scientific basis". By arguing that theoretical studies are simply inadequate for inferring the existence of patterns of disproportionate distribution, he implied that qualitative description just cannot "meet reasonable scientific standards" and so such research should never be considered by decision-makers.

He further stressed that although it is a mistake to claim that the scientific view is the only thing that matters when dealing with EJ issues, it would be equally wrong to present theoretical or even ethical problems in the form of scientific arguments. When assessing the patterns of the distribution of environmental hazards, he argued that the concern should be restricted to "scientific argument" (Bowen 2002).

2.5 Does the EJ science provide enough evidence for the EJ thesis?

In this section I will conclude the support of science for the EJ movement by observing scopes and contents of scientific evidence. Broadly, both race and income are statistically significant on the national scale in the first wave. However, despite race and income still being important, no nationwide evidence can be found in the second wave. Moreover, researchers of this wave argued that people should focus on intent in discrimination, rather than simply the fact of disproportionate exposure. Finally, race was dismissed from consideration of third-wave EJ researchers. Although researchers still considered that the correlation of income can be found in small scale, because of the immaturity of empirical EJ researches, none of them should be taken into consideration in policy decision-making process. In sum, the evidence that can be adopted to support the EJ movement was growing less and less.

[26] One may ask: Why is an "anecdote" a "theory"? According to the second- and third-wave adherents, quite a few first wave theories are built on such anecdotal evidence rather than serious research. For instance, the "Cancer Alley", an area along the Mississippi River between Baton Rouge and New Orleans, is often quoted as a typical example of environmental racism. Because the cancer clusters in Cancer Alley have not been scientifically confirmed, these challengers refuse to accept such anecdote as evidence. For them, the EPA is fighting something which does not exist. See: (Clegg 1998; The Washington Times 1998; Foreman Jr 2000)

3 The conflicting terms of EJ: an analysis of the discourse

3.1 Introduction

Before turning to theoretical and scientific disputes, it is crucial that three highly confusing notions be identified within the EJ literature -- environmental racism, environmental equity, and environmental justice[27]. These terms have often been considered synonyms and been conflated with one another. Broadly, as it relates only to racial issues, environmental racism is the term used in the narrowest domain. Environmental equity, central to both income and racial redistribution issues, is at the meso scale. Together, these two terms are part of a larger environmental justice domain, with equations of EJ to environmental equity or EJ to environmental racism (sometimes even environmental racism to equity) to be found almost all the EJ literature.

In practice, these terms are used inconsistently and their domains are not clear. In this chapter, the question explored will be: What does the phrase environmental justice/equity/racism really mean? Two foci are worth noting: how science is utilised in defining these terms and how the concept of EJ has changed over time. I attempt to demonstrate the process of constructing EJ in terms of terminology and by using the tools supplied by SSK (Sociology of Scientific Knowledge). At the end of this chapter, we will see that activists adopted each term for mainly practical reasons. After scrutinising the construction of EJ terms, I have made clear how key EJ terms have changed in meaning and later became conceptually unstable.

3.2 Environmental racism: EJ in a racial sense

[27] It is notable that, here EJ is the overall phenomenon as well as (in environmental justice) a specific version of it.

Reviewing the history of EJ, it is clear that EJ grew out of a series of anti-environmental-racism movements. Therefore, the term "environmental racism" was coined earlier than the other EJ terms. This term, environmental "racism", is an original concept that postulates a possible coalition between the environmental movement and advocates for civil rights and social justice. The phenomenon of EJ's racialisation, environmental "racism", served as a powerful rhetorical and emotional tool for grassroots activists, especially in the early period of EJ movement. However, partly because federal government agencies in the US have never adopted the term to guide their policies[28], scholars, decision makers, lawyers, and activists continue to debate the meaning of environmental racism.

Despite the diversity of this term's interpretations, some consensuses can still be found. A rare effort to specify this term precisely occurs in the former head of UCC Benjamin Chavis's definition (1994). After his direct participation in 1982's Warren protest, he has frequently received credit for introducing this term:

> Environmental racism is racial discrimination in environmental policy-making and enforcement of regulations and laws, the deliberate targeting of communities of color for toxic waste facilities, the official sanctioning of the presence of life threatening poisons and pollutants for communities of color, and the history of excluding people of color from leadership of the environmental movement. (Chavis 1994xii)

Another well-known figure defining the term is the scholar, Bunyan Bryant. In the book *Environmental Justice* (1995), he defines environmental racism as follows:

> It is an extension of racism. It refers to those institutional rules, regulations, and policies of government or corporate decisions that deliberately target certain communities for least desirable land uses, resulting in the disproportionate exposure of toxic and hazardous waste on communities based upon prescribed biological characteristics. Environmental racism is the unequal protection against toxic and hazardous waste exposure and the systematic exclusion of people of color from decisions affecting their communities. (Bryant 1995: 6)

[28] According to the EPA, it can only act on the basis of solid scientific data. It is considered that environmental "racism" is too difficult to measure and quantify. Thus, the EPA preferred the term of environmental equity. However, the unspoken reason was perhaps that the word racism carries too much emotional baggage. More details see: (Rhodes 2005:14-17); see also: (US EPA 1992a)

With the statement of "deliberate targeting", the ongoing debate about this term's definition concentrates on the question of "intent". While both Chavis and Bryant suggest that accusations of environmental racism demand the proof of *intentional* discrimination, others emphasise that the presence of toxic waste in minority communities itself constitutes racism. As Bullard (2000:98) has stressed:

> *Environmental racism* refers to any policy, practice, or directive that differentially affects or disadvantages (whether intended or unintended) individuals, groups, or communities based on race or color. (Italics in original.)

The argument over intent is by no means trivial. Needless to say, facing blame for environmental injustice, the hazardous waste industry and government officials completely deny the accusation that racial discrimination played a part in their decisions over site location. In order to identify who is responsible for EJ, activists filed a series of lawsuits against the authorities and the waste management industry. In all these suits, the court constantly insists that the plaintiffs are responsible for proving a sufficient pattern or practice of discrimination to support a finding of intent.

In many ways, the most difficult part of this intentional discrimination theory is determining how to test or evaluate people's intent through scientifically identifying a pattern in the behaviour of defendants. Three court cases are noteworthy for their focus on the use of science in identifying the social and economic characteristics of residents potentially affected by the facilities. These cases illustrate how a legal term, intent/discrimination, was considered in the manner of science. Furthermore, how boundaries were delineated by differential actors, here mainly plaintiffs, defendants, and the court, will be explored as well.

3.2.1 Bean v. Southwestern Waste Management, Corp.[29]

[29] 482 F. Supp. 673 (S.D. Tex. 1979), aff'd without opinion, 782 F.sd 1038 (5th Cir. 1986). This case can also be found in Westlaw Database. Free access sees: http://law.jrank.org/pages/13187/Bean-v-Southwestern-Waste-Management-Corp.html

In 1979, an African-American community started a fight to prevent a solid waste landfill from being set up in their suburban middle-income neighbourhood. Residents formed the Northeast Community Action Group (the plaintiffs), NECAG[30], and filed a lawsuit in order to block the facility from being built. The plaintiffs charged the Texas Department of Health (TDH) with discrimination in granting Southwestern Waste Management a permit to operate a solid waste facility in East Houston. This lawsuit was the first of its kind in challenging a siting decision on civil rights grounds. While the court acknowledged that this site was "unfortunate and insensitive", it still denied the plaintiffs motion as the plaintiffs' statistical information failed to show sufficient evidence for defendant's discriminatory intent.

In *Bean*, the court did not review the actual impacts of the facility, but based its analysis on demographic statistics about the minority populations generated from census tracts (Collin 1992; Tsao 1992; 1994; Zimmerman 1994). The court reasoned:

> The burden on [the plaintiffs] is to prove discriminatory purpose. That is, the plaintiffs must show not just the decision to grant the permit is objectionable, but that it is attributable to an intent to discriminate on the basis of race. (482 F. Supp. at 677)

To determine a pattern of discrimination, the court recognised that it is necessary to compare the racial composition in both "census tracts" and "the broader neighbourhoods"[31] where the facilities were located. The residents concentrated on two legal theories to establish this intent. First, they alleged the TDH's decision to issue the permit was part of a pattern or practice of discrimination. Second, considering the history of landfill siting and the issuance of permits, the plaintiffs contented that the TDH's approval of this permit constituted clear discrimination. Both legal theories were premised on large quantities of data and statistics and the plaintiffs relied on a series of statistical analysis on varying geographic areas in the

[30] According to Bullard (1995; 1999; 2000; 2001), at the urging of NECAG's attorney, Linda McKeever Bullard (also Bullard's wife), he conducted a case study of waste disposal practices in Houston. This is the start of Bullard's lifetime concerns on the EJ. Most of his findings were used in *Bean*.

[31] Please pay special attention to the units of analysis that the courts used in *Bean* and the following cases. Census tracts are widely accepted by the later second-wave scholars. Regarding neighbourhood, its definition is less clear. Bullard sometimes refers his unit of analysis as neighbourhoods. The issue of analytical unit will be discussed in more detail in the next chapter.

proximity of the proposed facility (Collin 1992:520-524).

In relation to the first theory, the court found that TDH had approved seventeen sites by 1978. Of those, fourteen were sited in census tracts with a minority population making up to 50% of the community; ten were located in census tracts where 25% or less of the total population was minorities. In the "target area",[32] where 70% of their population was minorities[33], TDH had approved two sites for solid waste disposal. One was in a census tract having only 10% minorities at the time of its opening; the other, the site being challenged here, was however located in a census tract with a 60% minority population. After reviewing the statistics above, the court concluded that because as many as half of the sites were located in an area where its minority population was less than 25%, statistical evidence alone failed to demonstrate a clear pattern or practice of discrimination.

In the other theory, the plaintiffs provided three sets of data to support their argumentation. The court however rejected all of them. The first set of data offered by the plaintiffs focused on the two solid waste sites to be used by the City of Houston. Since both of these sites are located in the target area, this proved discrimination, the plaintiffs argued. They further stressed the fact that the target area's population amounted to only 6.9% of Houston's total population; it however hosted "100%" of this city's type I landfills. The court used the same grounds, one of the two sites was in a White tract (less than 25% minority population), to reject this data set. Meanwhile, two sites did not constitute a statistically meaningful sample to infer discriminatory intent, the court noted.

The second data set concerned the total number of these facilities. The plaintiff's argument was that 6.9% of Houston's population lived in the target area; however, they hosted 15% of these facilities in the city. Since 70% of the target area population

[32] Target area is a term referring to an area designated by the federal government as low income. See: Rodriguez v. Barcelo, 358 F. Supp. 43, 45 (D.P.R. 1973). Since a target area was initially designed for identifying various income groups, the court recognised that the plaintiffs' definition and selection of so-called "target area" is scientifically questionable. However, it asserted that this approach was somehow "useful" and worth to further examination. See: 482 F. Supp. at 677, 678.

[33] Here, two scales were used to analyse its demographic features: target area and census tract. The plaintiffs' claims were based on target areas; the court however relied on census tracts in its analysis.

was composed of minorities, the plaintiffs contended that this disparity constituted discrimination. The court however stated that, outside the target area, the other facilities were located in tracts which were more than 70% White. Thus, no discrimination can be determined from this data either.

The final data set separated Houston into two halves. The eastern half contained 61.6% of the minority population and hosted 67.6% of this city's solid waste facilities. The western half however had a 73.4% White population, and only 32.4% of waste facilities. The disparity between the 67.6% and 32.4% concentration of facilities constituted discrimination, the plaintiffs alleged. Again, the court disagreed with this argument because it neglected the fact that the industrial area was located in the eastern half of the city. In other words, the alleged disparity may simply be the result of industrial agglomeration.

As the first lawsuit against environmental racism, *Bean* gave the EJ movement a very "scientific" start. Unlike other human rights lawsuits, *Bean* heavily relied on statistical evidence to support its case. In so doing, the legal terminology, discriminatory intent, was translated into scientific/geographic patterns between race and the location of facilities. According to the court, however, the available data, both city-wise and in the target area, were unable to prove that such a pattern really exists.

3.2.2 East Bibb Twiggs Neighborhood Association v. Macon-Bibb County Planning & Zoning Commission[34]

Like *Bean*, *East Bibb Twigg (Bibb),* Georgia, also challenged the local authority's (the Planning and zoning Commission's) permit approval by arguing that this decision was motivated, at least partially, by racial discrimination. In order to evidence their claim of environmental racism, the plaintiffs constructed three theories and data sets. Having reviewed the administrative history of the permit and the data

[34] 706 F. Supp.880 (M.D. Ga.) aff'd 896 F.2d 1264 (11th Cir. 1989). The original case can be found in Westlaw. See also: http://law.jrank.org/pages/13203/East-Bibb-Twiggs-Neighborhood-Association-v-Macon-Bibb-County-Planning-Zoning-Commission.html

derived from both “census tracts” and “governmental districts”, the court ruled that the plaintiffs had failed to demonstrate a clear discriminatory impact or intent (See also Collin 1992; Tsao 1992; Hoban and Brooks 1996).

To begin with, the plaintiffs pinpointed the discriminatory impacts of this permit decision. They argued that the proposed facility was located in a census tract with a 60% Black population. As a result, issuing this permit would most impact the African American community. The court, however, noted that the only other landfill permitted by the Commission was located in a 76% White census tract. In other words, no obvious patterns of discriminatory impacts could be found.

The plaintiffs then changed their unit of analysis and further argued that it is true that one landfill was in a White census tract and the other was in a Black one; putting these landfills in a bigger picture, both of them were in factually a Black governmental district where the African American population were around 70%. By stressing the importance of using “census tracts analysis”, the court however denied the plaintiffs’ contention.

The plaintiffs’ final theory relied on the history of racially based decisions by the Commission. They argued that fifteen years ago the Commission had issued a report recognising the existence of racial discrimination in this area. Furthermore, they questioned the reasons why the Commission changed its decision after initially denying the permit. To this argument, the court reviewed not only the administrative history of this particular permit, but also the past record of this Commission’s previous decisions. It found that the Commission’s prior permit decision was in a White census tract. Also, no evidence showed that the Commission has suddenly changed its zoning classifications or relaxed its permit-issuing standard. The court ruled that the Commission had no history of tending to authorise facilities in Black communities.

Two issues are important in *Bibb*: the standards for determining a claim of discrimination, and the analytical unit used to determine the impacts of the site.

Regarding the first, the court closely followed the test suggested in *Arlington Heights*[35]. According to the US Supreme Court, in order to prove a claim of discrimination in violation of the Equal Protection Clause, a plaintiff must establish two things: the governmental officers acted with a "discriminatory intent" and their action had a "discriminatory impact". Under this standard, scientific evidence of a disproportionate risk distribution alone is *not* enough to support one's claim in a discrimination case. In terms of the second issue, the court emphasised the importance of using census tract analysis. That is, the court compared census tracts with facilities against those without to determine the existence of the discriminatory impact and the role of historical discrimination. As some pointed (Collin 1992:526), in *Bibb* the court almost overstated the importance of using census tract test; and therefore other relevant analytical units were overlooked. In sum, the court established tough standards for one to prove discrimination.

3.2.3 R.I.S.E., Inc v. Kay[36]

In *R.I.S.E.* (Residents Involved in Saving the Environment), plaintiff challenged the decision of the county commissioners to site a landfill near an African American community. Originally, *R.I.S.E.* was concerned with environmental problems, like noise, odors, and decreased property values, though after its initial opposition to the project failed, its focus shifted to environmental racism. In King and Queen County, Virginia, the population was approximately 42% Black and 57% White. After demographic analysis, the court confirmed a disproportionate impact on the Black community; thus, the plaintiffs had met the first step of the discriminatory equation set forth in *Arlington Heights*. Nonetheless, the court noted the impact of a discriminatory action provides only a "starting point" for determining whether the

[35] In *Arlington Height*, the US Supreme Court recognised five factors in determining one's discriminatory intent. Considerations include the following: 1. the impact of the challenged action-whether it bears more heavily on one race than upon other; 2. the historical background of the decision; 3. the specific subsequent of events leading up to the challenged decision; 4. any departure, substantive or procedural, from the normal decision-making process; 5. the legislative or administrative history of the challenged decision. A good summary see: *Bibb* at 884. More fully see: *Arlington Heights v. Metropolitan Housing Corp.*, 429 U.S. 252 (1977).

[36] 768 F. Supp. 1144 (E.D. Va. 1991). The original case can be found in Westlaw. See also: http://law.jrank.org/pages/13207/R-I-S-E-Inc-v-Kay.html

action had been motivated by discriminatory purpose. The court then ruled that the plaintiff had failed to supply sufficient evidence to show the choice of site itself was intentionally discriminatory.

Unlike the previous cases, census tracts were *not* used in this case, because African Americans were extraordinarily concentrated in much smaller areas around the target landfills. The court was not dependent on a particular unit of analysis, like census tracts or zip code, but reliant on the concentration of African American at various *distances* from a particular facility. Within a half-mile radius of the targeted siting area, African Americans accounted for 64% of the population; specifically, there were 39 Blacks (64% of total) and 22 Whites (36% of total) living and 61 people in total in this area. Further, 21 Black families and 5 White ones lived along the 3.2 mile road leading to the proposed landfill. Investigating this particular landfill alone, there seemed to be a racially disproportionate distribution. In order to identify a disproportionate impact on the Black residents, the court insisted on examining the demographics and the siting procedures of the past four landfills from 1969 to the present.

The Mascot Landfill, sited in 1969, was the first one examined. The racial composition of the population who lived within a one-mile radius of this landfill was 100% Black. Moreover, there was an important Black community church only two miles away from this landfill. The second site, the Dahlgren Landfill, was sited in 1971. Around 95% of the population living in the immediate area at the time was Black. When the *R.I.S.E.* complaint was filed, within a two mile area, 90-95% of the population was Black. Owenton Landfill was the third one discussed by the court. When this landfill was first established in 1977, all residents within a half-mile radius of it were Black. The First Mount Olive Church, another African American church, was within a one mile radius of the site. The fourth site, King Land Landfill, was developed in 1986. This private landfill was originally located in a predominately White neighbourhood. Although this landfill had received a state permit to operate initially, it was shut down when the county obtained an injunction to stop its operation, due to environmental violations and the community opposition.

While taking note that "[t]he placement of landfills in King and Queen County from 1969 to the present has had a disproportionate impact on [B]lack residents,"[37] the court found that "official action will not be held unconstitutional solely because it results in a racially disproportionate impact. Such action violates the Fourteenth Amendment's Equal Protection Clause only if it is intentionally discriminatory"[38],

To sum up, in *R.I.S.E.* analyse of how a specific unit of analysis was selected to demarcate spatial boundaries were irrelevant as a high proportion of minority populations were so close to the sites. There is, however, still a question of why and how a particular "distance" was chosen by the court. Moreover, according to the court, finding a disproportionate impact on Black residents was only the first step to determine whether or not an official action was motivated by a racially discriminatory intent. After reviewing this county's siting procedures, the court concluded that there was nothing unusual because "the Board appears to have balanced the economic, environmental, and cultural needs of the county in a responsible and conscientious manner."[39]

3.2.4 Pattern seeking: Scientifically addressing the harm of environmental racism

Having reviewed these three failed cases, it is not hard to recognise why Bullard (2000:98) insists that intentional discrimination is *not* the most plausible way of identifying environmental racism. He asserts that, since the roots of racism may be so deep and may have been difficult to eliminate, discriminatory outcomes/impacts may not always result from discriminatory intent. By arguing that "harm perpetuated by benign inadvertence is as injurious as harm by purposeful intent" (cited in Ringquist 2006:251), later commentators reinterpret environmental racism as "any" decision-making process and distributive patterns that results in unequal burden on the minorities. This new interpretation originally attempted to avoid the difficulty of

[37] *Id*. at 1149.
[38] *Id*. at 1149.
[39] *Id*. at 1150.

proving someone's intent. It seems to me that the problem is not yet completely solved. Under this new interpretation, activists still need proof of disproportionate impacts, but exactly what constitutes these impacts and how best to test/measure them remain in dispute.

So as to prove a defendant's discriminatory behaviour, plaintiffs have to objectively illustrate the pattern/impact of disproportionate siting-decisions in court. In other words, legal terms like discrimination and intent are re-conceptualised as a scientific/statistic terms in the analysis of a right violation. The essence of such an analysis is generally comparative and the court uses it, as the first step, in determining whether the plaintiffs, as individuals, have been denied rights shared by others on the basis of group membership. Some commentators (such as Foster 1993) describe this approach as a (constitutional) civil rights paradigm. Under this process of comparative analysis, the harm of environmental racism is defined as either the denial of a right to a clean environment or the right not to shoulder an unequal burden of toxins.

There are three notable features concerning environmental racism. Firstly, racism in a legal sense is construed to mean conduct that is intentionally, or at least consciously, motivated by race. That is to say, to label a conduct racially motivated means also that the intent attaches to an individual actor. Accordingly, the burden of finding a "single bad actor" has become a critical weakness under this paradigm as it is not always easy to spot a single responsible perpetrator (Cole 1992:642; Foster 1993:732). In most cases, several facilities, ranging from toxic factories to incinerators, may have been concentrated in one neighbourhood. This is why lawsuits are filed against the permitting process instead of lodged against a particular facility. Moreover, in the debate over "which came first" (Blacks or facilities), second wave adherents insist that "the dynamics of a free market" may be the single root cause of racial inequities, at least in some cases. If that is the case, the charge of environmental racism in these cases is likely to be dismissed by court since no individual "bad" actor can be found.

The second thing to be noticed is the limits of shifting the burden of proof. As Bullard (1995; 1999; 2000; 2001) has repeatedly argued, to prove intentional or purposeful discrimination in a court is next to impossible. Consequently, it should not be necessary for the plaintiff to prove a polluter's intent. In addition, in order to protect impacted communities possessing no expertise and few resources to hire lawyers, shifting the burden of proof to polluters is essential; that is, he proposes that at the very time companies apply for operating permits, they must "prove" not only that their operations are not harmful to human health, but also that these operations are not discriminatory and will not disproportionably impact minorities. The limitations on this argument are obvious. Just as the plaintiff cannot prove the defendant's intent, it is also next to impossible for a defendant to prove him- or herself innocent, or that their operations are non-discriminatory. On the contrary, suppose a defendant can and does prove that its operations have no disproportionate impacts on minorities at the time of site selection. If the dynamics of unequal distribution is driven by market powers, rather than selection processes, over the long run there is little chance of keeping low-income and minority families from moving into the vicinity of these facilities. In short, shifting the burden of proof is no panacea for curing environmental injustice.

Finally, the details of the analytic practices utilised in the court should never be overlooked. As we can see, the means of analysis seem be inconsistent in these cases. In *Bean*, several analytical units were used to construct defendant's racial intent: the entire city of Houston, the eastern and western halves of the city, specific tracts, and a target area. In *Bibb*, the court accepted a narrower interpretation of the role of historical racial discrimination and argued that census tracts alone are sufficient to simulate actual impacts [40]. Finally, due to African American's extraordinary concentration around the target landfills, the court decided to use varying distances from the site as a device to inspect the distribution of a population in *R.I.S.E.* The question now arises: Is there a single most appropriate means [41] for examining environmental racism or environmental injustice?

[40] The court assumed that a landfill in any particular census tract must impact more heavily upon that census tract than upon other. See: *Id.* at 884.
[41] I will deal with this issue in the next chapter.

One possible solution is to alter or extend the meaning of environmental racism, or environmental injustice, so that the term incorporates most EJ phenomena. For instance, Pulido (1996) has noted the contested meanings of environmental racism and issued challenges to this term's prevailing interpretations. Her research both reveals multiple discourses of "race" and "racism" and how research has served to advocate a narrow and political limited concept of racism in academic and policy circles. In criticising the definitions that reduce environmental racism to acts of intentional discrimination, Pulido notes that racism is not uniform, which means that the phenomena of environmental injustice cannot be isolated from other forces and forms of difference. In order to rectify these narrow definitions, she suggests that studies of environmental racism be considered historical processes of racial formation, acknowledge the diverse forms of racism that result from other differences (such as residence, job and diet differences), and incorporate more sophisticated theories of space and scale.

In the following cases, I will concentrate on how the concept of EJ has been "evolving", if at all, as both as a conceptual matter and an empirical one. The inherent problems of EJ will be discussed in depth. It may be true that the EJ terminology is evolving; certainly the phenomenon itself remains contested. EJ can hardly make any significant progress by simply extending a narrower terminology of environmental racism, I argue. Before turning to an examination of EJ, another less frequently used, but equally important term, environmental equity, will be discussed first.

3.3 Environmental equity: EJ in an income sense

Similar to the debates occurring over the issue of environmental racism, people continue to dispute or reinterpret the meaning of environmental equity. Yet, unlike environmental racism, which is mainly used in court or academia, federal agencies did adopt environmental equity as a guide to their policies. In this section, I will explore why this term was accepted at first but abandoned eventually by most

activists and the US EPA.

3.3.1 Individualising EJ: Is inequity an individual choice?

When concerns over uneven burdens of toxic wastes first came to federal decision-makers' attention in the early 1990s, the terminology that the EPA preferred was that of environmental equity rather than racism or justice, perhaps because it carries much less emotional baggage than racism. In January 1990, a conference entitled *Race and the Incidence of Environmental Hazards* was held at University of Michigan (see also Reilly 1992; Bryant and Mohai 1992a; 1992b). During this conference, concerned activists and academics formed the so-called *Michigan Coalition*. This Coalition appealed to the EPA to address issues related to EJ. Soon after the formation of Coalition, members of the Congressional Black Caucus and the Coalition met with EPA officials to discuss their finding that environmental risks were higher for minority and low-income populations. They alleged that the EPA's inspections were not addressing the needs of these communities.

In response, the EPA Administrator created the Environmental Equity Workgroup in July 1990 to address the allegation that "racial minority and low-income populations bear a higher environmental risk burden than the general population." (US EPA 2000) This workgroup is responsible for reviewing the evidence, identifying the causal factors behind inequity and re-examining the EPA's risk assessment and communication guidelines. In 1992, the workgroup issued a report entitled *Environmental Equity: Reducing Risk for All Communities* (*Equity Report*) (US EPA 1992a; 1992b).

In this report, environmental equity was defined against three concerns: the environmental policy-making process, the administration of environmental programs, and the distribution and effects of environmental problems (US EPA 1992a; 1992b; about the history of this report see US EPA 1992c). Plainly, this report raised the concerns about the access of racial and low-income groups to the policy-making process. It also considered the distributional issues of environmental problems in the

light of race and income. Thus, for the first time, were EJ's procedural and substantive dimensions established. What is more, in this report the EPA made it very clear that the reasoning behind choosing *environmental equity*, instead of environmental justice or environmental racism, is scientific:

> [Environmental equity] most readily lends itself to scientific risk analysis. The distribution of environmental risks is often measurable and quantifiable. The Agency [EPA] can act on inequities based on scientific data. Evaluating the existence of injustices and racism is more difficult because they take into account socioeconomic factors in addition to the distribution of environmental benefits that are beyond the scope of this report. (US EPA 1992a:10)

This report examined race and income, since these two variables were regarded as being associated with higher environmental risks. According to its findings, air quality in Black and Hispanic communities did not meet federal standards and commercial hazardous waste facilities were more likely to be located in Black and low-income communities. Meanwhile, this report noted that PCBs and dioxins are more likely to accumulate in the bodies of racial minorities due to racial differences in food consumption and dietary practices, especially in the consumption of the fatty fish tissue. In most cases, the lack of data and knowledge relating environmental health effects to race and income is a problem, the EPA concluded. However, it documented that variations in exposure to one specific contaminant, lead, related to income and racial factors. Their data showed a significantly higher percentage of Black children having high levels of lead in their blood in comparison with White children (Reilly 1992; US EPA 1992a; 1992b; 1992d).

At first glance, it seems that this report has officially confirmed most of the concerns raised by the EJ movement, whereas quite the opposite is the case. By making a connection between personal behaviour and exposure, the EPA implicitly adopted a "victim blaming" viewpoint (Foster 1993:736). That is, according to the EPA, *voluntary activities* are the major source of causing disproportionate distributions. For instance, in the finding on air pollution above, the EPA attributed the outcome to the fact that air pollution is "primarily an urban phenomenon, where emission densities tend to be the highest" (US EPA 1992a:13). Consequently, more hazards

were found in African American's blood is simply because "[a] large proportion of racial minorities reside in metropolitan areas and may be systematically exposed to higher levels of certain air pollutants" (US EPA 1992a:13). Likewise, minorities' higher exposure to pollutants from toxic waste sites is simply caused by that fact that "minorities are more likely to live near a commercial or uncontrolled hazardous waste site" (US EPA 1992b:7). For the same reason, their exposure to contaminated fish may derive from their eating and nutritional habits. Beyond that, after reviewing a study that revealed pesticides in Hispanic mothers' milk, the EPA surprisingly indicated that "since racial and ethnic minorities comprise the majority of the documented and undocumented farm workforce, they may experience higher than average risk from agricultural chemicals" (US EPA 1992b:10).

The EPA's stance toward EJ is evidently similar to Been's idea of "coming to nuisance" (Been and Gupta 1997). It suggests that the distributional patterns of environmental problems in terms of race or income may have roots in one's choices of residence, job and diet:

> [I]t is becoming increasingly apparent that a person's activity pattern is the single most important determinant of environmental exposure for most pollutants. (US EPA 1992b:7)

The blame, the EPA's argument implies, falls to individual choices about where to live and work, and what to eat. Just as we cannot force smokers to quit, defining environmental equity as a matter of personal choice, or even a kind of "freedom", implies that there is nothing the EPA can do to tackle these issues.

Not surprisingly, this report's recommendations were primarily procedural. It especially focused on how to involve more minorities or low-income groups in the decision-making system. No substantive imperative or remedy was imposed by the EPA. Its most specific suggestion on substantive justice is that more exposure data by race and income is needed and in order to reduce high concentrations of risk on particular population groups, the EPA should revise its risk assessment process to

incorporate the conception of environmental equity[42].

In sum, the term, environmental equity was selected for its "scientific" nature. And, science/scientific assessment, the EPA suggests, is the best, if not the only way, to tackle these problems. The EPA especially relies on it to determine whether there are any population groups at disproportionately high risk. Finally, this report implied that environmental equity may be caused primarily by personal choices.

3.3.2 What is wrong with the term of "equity"?

As we have seen, since the report was published, "Environmental Equity", became a term heavily implicated in scientific methods of risk measurement. This report included eight recommendations, one of which was to create mechanisms to address these inequities; thus, the Office of Environmental Equity was established in November 1992. Yet, is "equity", or as some commentators called it the environmental (equity) paradigm (Foster 1993), a more desirable term for the EJ movement's goals?

3.3.2.1 From pattern seeking to harm assessing

To understand this paradigm, it is essential to identify the way that causation of harm is understood. Within this paradigm, the *Equity Report* conceptualises harm as the health impact resulting from any environmental degradation and contamination. In order to identify and measure harm, it is crucial to find a scientifically measurable link between exposure to hazardous materials and their impacts. The EPA does this by assessing the potential harms of a given substance and then setting a marginally acceptable level of safety to prevent physical environment and human health losses. In sum, under this paradigm the EPA seeks to prevent harms from happening by reducing them to the level where they have no detectable health effects.

[42] In chapter 5, I will argue that these suggestions are by no means easy to achieve.

Unlike the remedial nature of the civil rights paradigm, under which a deprivation in relation to right is identified when a harm is caused by the "perpetrators", the environmental paradigm is, by nature, preventative. EJ advocators need not identify a specific perpetrator or demonstrate the intent of discriminatory behaviours. At first sight, this preventative approach seems much better suited to address injustice than a remedial one, since health losses may not always be easily remediable. However, after investigating *Equity Report*, it is rather obvious that exactly the opposite is the case. The EJ movement effectively has to surmount an even greater obstacle within this paradigm. In this report, the EPA did conclude that there is sufficient evidence of racially disproportionate environmental hazard exposure. However, without scientific evidence to demonstrate a clear link between hazard and at least "potential" health harms, no harm is said to have occurred.

Risk, the EPA stresses, is assessed in two steps. In the first step, a risk assessment is conducted. This process of assessing risks, according to the EPA, is almost exclusively dominated by a "scientific understanding of risk". After the assessment, officials obtain "an estimate of the probability that human exposure to a chemical agent will result in an adverse health effect to the exposed individual, or an estimate of the incidence of the effect within an exposed population" (US EPA 1992b:30). Other factors ranging from social concerns to economic ones can only be considered once human health risk is identified, or the first step has been finished. Accordingly, it is in the risk management process, or the second step, where relevant environmental equity issues should be evaluated. Because the EPA believes that it can only "act on inequities based on scientific data" (US EPA 1992a:10), a proper EPA response should only be considered during the second step, rather than in the beginning of the process of risk assessment.

Needless to say, while the initial purpose of this environmental paradigm is to regulate the level of harm and to protect human health, its practical application severely limits the possibility of claiming injustice. Now, unless EJ advocates can scientifically demonstrate both the unequal distribution of hazardous facilities and actual health harms arising from the facilities, no remedial actions can be taken

through the EPA or the courts. Since most human effects of environmental harm are chronic, it is even harder and costlier to consider actual or potential harms than to simply demonstrate patterns of facilities' spatial distribution[43].

3.3.2.2 Does equity mean sending wastes to White communities?

Not only is the EPA's dependence on risk assessment problematic, the term *equity* is itself misleading as well. From a social movement perspective, characterising a problem in terms of equity raises the possibility of distracting the aims of the EJ movement and moving from the prevention to the redistribution of pollution. Explicitly, so long as the toxic wastes are equally distributed, no matter how intensive the pollution is, environmental equity can still be served.

As we have seen, the *Equity Report* did not offer any substantial policy to remedy unequal distribution. However, the term "equity" implies redistribution is one way of resolving the problem. In order to protect African American or poor communities, the EPA may consider simply shifting some of the wastes to impoverished White communities. Or, they can put a ban against issuing any more wastes to those communities that have already shouldered the burden of facilities. Once poor and Black communities are unavailable for dumping, the less richer or White communities will be forced to accept wastes into their communities. Eventually, people will bear equal burden of wastes, and may decide to shift to less polluting lifestyles (Been 1994b; Maher 1998:366; Schelly and Stretesky 2009).

Sure enough, activists criticised both the terminology and the EPA's dependence on risk assessment models. Under pressure from these activists, the EPA soon followed their lead and accepted the more inclusive term *environmental justice*[44] (Holifield

[43] I will not discuss how risk assessment is carried out in practice until we reach the risk-related chapter. Here, I only wish to show the conceptual relationship between EJ and risk.

[44] This change may seem very sudden. In effect, a power shift in the Administration was perhaps the very reason causing the terminology shift. The Office of Environmental Equity was created in 1992 under the first Bush Administration. In 1993, President Clinton's Administrator Browner established EJ as one of the seven guiding principles in the EPA strategic plan. Another notable figure of this time

2001:80). After President Clinton proclaimed Executive 12898 in 1994, environmental justice has been elevated to favoured term in the US federal government as a whole. Meanwhile, the name of Office of Environmental Equity was changed to Office of Environmental Justice (OEJ) in the same year (US EPA 2000).

In spite of the EPA's shift in terminology, a number of academics continue to use the earlier terms of environmental equity and environmental racism, which continue to be interpreted in completely different ways in academic contexts. The distinction that Bullard (Bullard and Wright 1987) made between environmental equity and environmental racism has been useful for distinguishing analyses of geographic distinctions, or outcomes, from the historical analyses of the processes underlying present-day patterns. Considering environmental equity as a consequence of environmental racism, he stated:

> Blacks did not launch a frontal assault on environmental problems affecting their communities until these issues were couched in a civil rights context beginning in the early 1980s. They began to treat their struggle for environmental equity as a struggle against institutionalized racism and an extension of the quest for social justice. (Bullard 2000: 29).

Using environmental equity as a substitute for environmental racism is one efficient way to sidestep the almost insurmountable legal barrier of intent. When most people use the term, this term of inequity indicates *outcomes*, not the result of intent to harm or exploit (Rhodes 2005:16-17). After losing the battle in *Bean*, it is not hard to know why Bullard made such an interpretation.

Yet, not everyone shares Bullard's stance on the term of environmental equity. Some commentators (Holifield 2001:80; Rhodes 2005:16-17) severely criticise this term for the reason that it lent itself to a purely scientific understanding of EJ. Moreover, they worry that the EPA may categorise EJ as a problem of re-distributing risks, rather than prevent them. After recognising the political implications of the term's history, this group of commentators urge scholars to think hard whether it remains

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is Senator, later Vice President, Albert Gore. Gore was the very person who introduced "Environmental Justice Act of 1992". See: (Bullard, Mohai et al. 2007:chapter 2; US EPA 2009d)

appropriate to use this term. In order to achieve a more sophisticated understanding of the unequal distributional issues, they suggest that EJ research move toward a deeper understanding on structural injustice questions. Given that federal agencies and many activists now avoid the term *environmental equity*, they suggest that we drop this term altogether.

3.4 Environmental justice: A better term than the others?

Although environmental justice is used as diversely as the other two in the literature, it is arguably the most inclusive and most accepted term from both a social movement and a government agency perspective. As Pellow (2000: 582) has noted, environmental racism is what activists are fighting *against*; environmental justice is what they are fighting *for*. Concentrating on not only a particular social group, such as race or income groups, environmental justice targets "any form of unequal distributed environmental hazard."

It is fair to say that environmental justice takes a small step further than environmental racism. The concept of EJ not only "demands the cessation of the production of all toxins, hazardous wastes, and radioactive materials," but also "demands the right to participate as equal partners at every level of decision-making" (The First National People of Color Environmental Leadership Summit 1991). Again, Bryant (1995) made a bid to capture its meaning:

> Environmental justice (EJ) … refers to those cultural norms and values, rules, regulations, behaviors, policies, and decisions to support sustainable communities where people can interact with confidence that the environment is safe, nurturing, and productive. Environmental justice is served when people can realize their highest potential…. EJ is supported by decent paying safe jobs; quality schools and recreation; decent housing and adequate health care; democratic decision-making and personal empowerment; and communities free of violence, drugs, and poverty. These are communities where both cultural and biological diversity are revered and highly reversed and where distributed justice prevails. (Bryant 1995: 6)

From Bryant's definition, it is evident that environmental justice addresses numerous issues not traditionally associated with the environment, such as asking for cultural diversity and communities free of violence. This expansive and more inclusive term includes provisions for both distributive justice and procedural justice. Distributive justice is concerned ensuring that no social group, no matter its socio-economic or racial character, suffers a disproportionate burden of negative environmental impact. Moreover, this substantive aspect of EJ emphasises the right to live in and enjoy a clean and healthful environment. As a result, it is not only reactive to environmental "bads", but proactive in the distribution and achievement of environmental "goods", such as a higher quality of life. On the other hand, procedural justice is concerned with ensuring that all communities have access to relevant information and claims that there should be a mechanism to allow locals to participate fully in decisions affecting their environment. Thus, procedural justice refers to a meaningful involvement of all people and citizens' access to decision-making processes (Agyeman and Evans 2004; US EPA 2006; Schlosberg 2007). These two elements of the definition of EJ have appeared in official documents bearing on the subject.

At first glance, it seems that environmental justice transcends the meaning of environmental equity as it focuses on ameliorating potentially harmful conditions and on empowering the poor and people of colour by improving their overall participation. Nevertheless, similar to environmental equity, the term environmental justice remains subject to scientific measurement and definitions.

3.4.1 No easy way to achieve EJ

The meaning of EJ may be broader and less confusing than the terms of environmental racism and equity. Yet, simply accepting this new term does not mean that it has paved an easier way for achieving EJ. The proposed Environmental Justice Act of 1992[45] provides an example of how hard it can be. Were this bill enacted, the EPA would have been required to identify the top 100 counties, or other spatial units, containing the highest aggregated total amount of environmental toxics. These

[45] H.R.2105, 103d Cong., 1st Sess. (1993).

identified places would be classified as Environmental High Impact Areas (EHIAs). This bill further called for health impact study on evaluating "the nature and extent, if any, of acute and chronic impacts on human health" in the vicinity of EHIAs. If any significant adverse impacts are found, a moratorium will be issued on the siting or permitting of any further facilities that may impose more risks onto the EHIA. Once the building of building new facilities within EHIAs is stopped, the accumulated quantities of hazardous substances in human bodies, at least in theory, will remain stable over the long run.

Compared with cases in environmental racism and environmental equity, this approach is neither remedial nor preventive in nature. It simply says that no more facilities should be sited in an area where a disproportionate concentration of such facilities has been identified. However, it says nothing about where the next facility should be located or how to cure or compensate damages that have happened in those polluted areas. In addition, instead of providing a comprehensive assessment of the burdens that this community is bearing, this approach evaluates only the burden of toxic chemicals and says nothing about non-noxious burdens, such as prisons or shelters (halfway house).

The above-mentioned limitations soon invite criticism from the second-wave adherents. They argue that since this Act was concerned only about the places that have already reached some threshold of environmental risk, it illustrates a similar difficulty that arose in the case of the *Equity Report*. After being barred from siting a new facility in the top 100 EHIAs, the worst case scenario here may be that instead of going into one of the first 100 EHIAs, new facilities open and concentrate in the 101-200 ranked areas. It may be true that the second 100 EHIAs have slightly less toxic exposure, but residents there may shoulder much more non-noxious facilities than the top 100 EHIAs. In that event, this approach does not offer a proper method to compare different burdens. More importantly, under this scheme some rich areas, say ranked 1,000th overall, may still shirk responsibility for sharing the burden of hosting any such facilities (critique see: Been 1994b; 1994c; 1994d).

By centring on a specific kind of burden, this proposed Act addresses EJ in a scientifically limited way. To calculate "total weight of toxic chemicals present" in an area or community will turn on two fundamental questions: how to determine where the facilities are located and how to measure the toxicity of a chemical and then compare the harm done with that due to others. On the one side, there is no straightforward means to spatially demarcate the location of a facility. The proposed Act originally assumed that an EHIA should be designated on a county-by-county (or political jurisdiction) base. It may be true that demographic data is more available on a jurisdiction base. This Act however does not justify why political jurisdictions are more appropriate geographical units for measuring EHIAs. In some cases, a facility may be located on (or even across) the border of several counties. In brief, a county-wide basis cannot reflect the actual impacted areas. Moreover, the population in those jurisdictions may not always be distributed evenly. Without taking density into account, a less toxic but high population density facility may be left out from the list of EHIAs. Instead, a highly polluted but low-density population area may be categorised as EHIA.

Weighting toxicity highlights another difficulty of this EJ approach. In the case of the *Equity Report*, both lead and pesticide poisoning are regarded as serious. However, in order to construct a ranking system, as the Act suggests, of how severe each chemical's toxicity is should be defined first, and then in comparison with the toxicity of various chemicals, the top 100 EHIAs can be demarcated. Giving no indication of how the toxicity will be determined, it is unclear how this system would eventually be established. Just as the evidence suggests elsewhere (Lavelle and Coyle 1992; Zimmerman 1993), the higher the level of Black or poor population in a community, the less likely the community will appear on the National Priority List (NPL) for pollution cleanup. It would be unsurprising to find that the priority (or toxicity) were distorted by politics. As discussed in the *Equity Report*, while it is known that lead poisoning damages health, and is a particular concern to the health of African American children, there has not been enough attention paid to this issue.

Another benchmark case arose in 1994 when President Clinton issued Executive

Order 12898. This Executive Order reinforced the 1964 Civil Rights Act Title (VI) that prohibits discriminatory practices and requires all US federal agencies and programmes receiving federal funds to begin to develop policies to promote a conception of EJ. Two vital points should be noted. This Order, on the one hand, indicates that the EJ movement's claims have been officially considered in the policy-making process. It also marks the introduction of the term environmental justice into federal policy. Its interpretation, on the other hand, leaves room for ongoing pollution so long as the negative effects can be shared proportionately. To illustrate the value of further attention to the difficulties of EJ, the following discussion details the practical problem the EPA encountered in developing a programme to deliver EJ.

Despite the Executive Order requiring federal agencies to ensure compliance with EJ requirements of the 1964 Civil Rights Act Title VI for minorities and low-income communities, the EPA had not produced any program or dealt with any single complaint for violation of Title VI. In 1998, the EPA finally published its *Interim Guidance for Investigating Title VI Administrative Complaints Challenging Permits* (*Interim Guidance*).[46] These guidelines established five steps to be taken in Disparate Impact Analysis. The first step is to identify the population affected by the permit, following which the racial and/or ethnic composition of the affected population is to be determined. Because there may be more than one facility in this area, the scope of facilities and total affected populations will be demarcated in the third step. After that, a disparate impact analysis will be conducted to compare the racial and ethnic characteristics within the impacted population. Finally, arithmetic or statistical analyses will be used to confirm whether the disparity in step four is significant under Title VI.

Again, the EPA faced a difficulty of determining whether the action or programme of an EPA funded recipient constituted discrimination in violation of Title VI. To tackle this problem, the *Interim guidance* attempt to translate the legal term, discrimination, into a scientifically practical term, "disparate impact analysis". Arguably, this

[46] For more information on Title VI and Interim Guidance, check http://www.epa.gov/oswer/ej/laws.htm and http://redbook.gao.gov/17/fl0084619.php .

guidance goes a step further than other approaches. Terms seem to be defined much more clearly in this step-by-step guidance. However, such guidance, as some commentators (Balter 2000; Lyle 2000) have noted, can only create more problems than it can solve, with the added problem some old difficulties occurring in previous approaches recur under these guidance as well.

In step one, the guidelines attempt to clarify its terms as below:

> The affected population is that which suffers the adverse impacts of the permitted activity…The adverse impacts from permitted facilities are rarely distributed in a predictable and uniform manner. However, proximity to a facility will often be a reasonable indicator of where impacts are concentrated.(US EPA 1998:8)

No matter whether or not we agree with its definition, this method apparently adopts the interpretation of the "potential" risk approach. In addition, proximity is considered the most appropriate indicator for determining potential risks. Yet, this definition does not make the guidelines less complex or less controversial. Various elements of analysis, like "how close is too close" (MacGregor, Slovic et al. 1999) and the determination of a facility's location are left unsolved. Without thoroughly understanding these problems, the steps outlined remain insufficient.

When conducting disparate impact analysis, for instance, the guidelines are particularly at a loss. A disparate impact analysis, as the EPA suggests, includes comparing the racial and ethnic characteristics of the affected population to non-affected population. After conducting the analysis, it should be clarified whether persons protected under Title VI are being impacted at a disparate rate (US EPA 1998:10). However, in effect, this guidance says nothing about how the communities to be compared will be identified, and how disparities between communities will be established. Eventually, even though such an analysis is conducted, it does not provide any meaningful means to advance EJ[47].

In addition, this guidance also relies on cumulative impact risk analysis for

[47] These issues will be developed more thoroughly in the next two chapters.

determining environmental discrimination, an approach that raises a new predicament: Should attention be focused on past, existing, or future injustice? That is to say, the EPA now has to consider the timing of issuing permits and then compare the effects of the permits against other non-affected communities. This *Interim Guidance* is strongly criticised by EJ activists (Balter 2000). The guidelines are accused of neglecting existing health disparities within the community affected by the proposed permit, meaning that, health disparities existing before the new facilities begin operations will not even be considered. For instance, let us say that before the construction of a facility, the EPA may conduct a disparate impact analysis and find to some extent disparity does exist. However, before the construction of the facility, the finding does not constitute a sufficient disparity. As a result, the EPA can still issue a permit for the construction of a facility. This cumulative impact approach implies that as long as the existing "discrimination"/disparity has not exceeded the marginal standard, or is not serious or discriminatory enough, more permits may be issued. The effect will indisputably lead to the construction of additional facilities or to further disparity in the targeted areas.

In the end, perhaps the actual analysis that these guidelines suggest can be summarised in the fourth step. A strict reading of this view implies that the related processes in EJ analysis all depend on step-wise, case-by-case judgements as situations develop:

> Since there is no one formula or analysis to be applied, the [EPA's Office of Civil Rights] may identify on a case-by-case basis other comparisons to determine disparate impact (US EPA 1998:10).

3.4.2 Beyond distributive justice?

In accordance with the directives of the Executive Order, government agencies promote diverse conceptions of environmental issues by interpreting the meaning of EJ. Overall, the official definitions of EJ broaden the limits to the kinds of issues that other terms cannot address. Thanks to its much more comprehensive meaning,

environmental justice provides the movement much of its rhetorical power. Several social constructionist researchers investigate how activists have successfully mobilised diverse affected communities by utilising EJ's conceptual frames, which provide rhetorical links between environmental movements and historical activism for civil rights and social justice (Capek 1993; Tesh and Williams 1996; Taylor 2000; Holifield 2001).

In order to evaluate the distribution of environmental hazards, two approaches, forwarded on the basis of different conceptual frames, can be identified (cf. Been 1994b; Helfand and Peyton 1999:70). One view, that we might call the "fair share approach", focuses on disparate exposure among various groups. Advocated by Bullard (1983), Gelobter (1992), and in part by the aforementioned *Interim Guidance*,[48] this frame accepts the hypothesis of "relative deprivation". The strictest interpretation of it implies that anyone, anywhere, should enjoy equivalent environmental quality or bear an equivalent share of the environmental burden. Accordingly, this approach suggests that people assess their communities' environmental quality or burdens by comparison with their neighbours instead of against an absolute standard of living.

The other view, exemplifies by Bryant (1995) and to a certain extent by the EJ Act of 1992,[49] can be called "safe minimum standards approach". In this case, activists do not ask for the same environmental quality in all communities, as does the fair share approach. Instead, the achievement of EJ is judged by the fact whether or not the government achieves all kinds of environmental standards in all places. With the aim of meeting safe minimum standards, this approach suggests different criteria, for instance air, water and other standards, to achieve minimum environmental equity.

These diverse views not only correspond to different philosophical perspectives but also imply that differences in the measures of one aspect of EJ across places may not

[48] The reason why it is only partially adopted is because it is still uncertain how to choose a comparison community.
[49] This argument is made from the point of view that this act attempts to identify 100 EHIAs, or where the safe minimum stands have not been met. In other words, facilities should go into places meeting the minimum standards. However, having been discussed, we still do not know how to decide these standards or 100 EHIAs.

be evidence per se of injustice in general. Without doubt, both approaches have political implications. On the one hand, the fair share approach attempts to describe these differences by socioeconomic and ethnic factors first and then seek remedies from authorities; the minimum-standard approach, in contrast, asks authorities to identify key standards and areas not meeting those standards first and then requires an explanation for their shortcomings relative to socioeconomic or ethnic variables (Helfand and Peyton 1999).

No matter which approach above we prefer, it is evident that the meaning of EJ continues to be challenged. Arguably, it is true that other terms claiming to speak of EJ is somehow narrowly defined; environmental justice is a more comprehensive term. The danger is that a broadly-defined term will inevitably bring its own methodological and philosophical baggage. That is, adopting an all-embracing term will not automatically resolve the previously unsettled questions. Even when a term satisfies a variety of interests, it still must face the problem of an absence of limits.

As Foreman (1998) contends, while the term's vagueness helps make it more effective in mobilising people, the fact that EJ concerns lack boundaries makes the concept a dubious guide to government policy. Viewed in this light, Harvey (1996; 1999) shares a similar viewpoint with Foreman. Appeals to a vision of EJ, rather than economic rationality, are essential and more suitable to inspire political action for social change. Yet, it is dangerous, he asserted, to lack a universal standard of justice. For example, after being institutionalised, environmental justice is given a prior position around all EJ claims. Those of other political interests, say built-environment, are somehow ignored. The result is that, as seen in the EJ Act, most attention is given to the geographic location of toxic facilities, but other burdens are entirely left out of the equation. In fact, some EJ critics even find it difficult to call non-area/toxic-specific issues environmental injustice (Rhodes 2005:27-28). For Harvey, to achieve concrete results, the investigatory framework should not only focus on whether geographic patterns or processes are just, but be situated in a broader philosophical debate about justice. By virtue of the quest for a universal standard of justice, the operative assumptions within such a frame should be made

explicit. In this way, Harvey indicates, it is easier to recognise the political aspects of our conceptions of justice.

In spite of Harvey's optimism regarding linkages in competing theories of justice and environmental discourses, exploring the potential connections continues to drive ongoing debates in political philosophy and social sciences. In comparison with Harvey, after scrutinising the theories of environmental sustainability and social justice, Dobson (1998) finds that these two concepts are related in three distinctive possible ways: the environment as something to be distributed; justice as functional for sustainable; and justice to the environment. According to Dobson, neither sustainability nor social justice has definitive meanings. Thus "there are more paths to legitimization in terms of compatibilities between the two than might appear at first sight" (Dobson 1998:242). This, I believe, is the fundamental problem arising from all the debates having been reviewed above. It will therefore need to be surveyed in much more detail rather than assuming their compatibility. The connection between sustainability/environment and justice is not automatic and may ultimately be incompatible, he concludes.

As we have acknowledged, environmental justice was used in a wide variety of distributive and procedural concerns. However, these concerns are involved in debates over the nature of justice and with the breadth and flexibility of the term. Even with a broader consensus over the issue, we cannot refer EJ to a single set of measurable conditions, as we have previously. Instead of assuming that the claims of EJ refer to a universal, monolithic agenda, we should ask what the terms mean in different contexts. Likewise, we should not impose artificial limits on the variety of environmental equity and racism. Environmental racism/equity/justice might mean a community fighting for access to clean water, or struggling to have a landfill built elsewhere (Schlosberg 1999; Holifield 2001; Gleeson and Low 2003; 2007). Embracing plural definitions of EJ related terms, we should not define EJ too finely. The variety of definitions led me to conclude that "there is no such a thing as EJ", but there are many "EJs" (Poirier 1994). To this end, an EJ scholar should provide the potential range and form of environmental-justice issues and, most importantly,

to make the operative assumptions within each EJ frame explicit, rather than providing definitive categories (cf. Rhodes 2005:29).

3.5 You have a dream; I have a problem: What does EJ really mean?

Most scholars and activists have used the terms environmental justice/racism/equity with little attention to how to define these concepts, nor to whether they are interchangeable in varied contexts. As I have revealed, people in different EJ waves/periods have used these terms in varying ways. It is true that the meaning of environmental justice is more inclusive than that of others. However, the nature of terminology alone cannot account for the reasons why activists had abandoned one term and then chosen another.

Activists abandon a term for much more practical reasons. When activists attempted to arouse mainstream environmental groups to face the fact that coloured persons are more likely to be exposed to hazards, environmental racism was the first term used to bring the issue into the realm of environmentalism. In terms of scope, this term faced two major difficulties. Drawing on the legacy of civil rights and social justice movements, as well as environmentalism, EJ advocates have successfully mobilised the impacted communities. Following a legal/civil-rights approach, before long they however found that it is difficult to scientifically manifest one's accusation of discrimination. The courts have rejected such claims over and over again. Most importantly, the concept of environmental racism has never been adopted by government agencies.

After EJ was written into the agendas of most environmental groups, activists no longer promoted the racial version of EJ. In order to integrate the poor into their schemes, the meaning of EJ was expanded using environmental equity and environmental justice, after which the strategy of racialising EJ was abandoned. Nevertheless, some advocates contend that the term environmental equity is inadmissible, due to its apparent emphasis on equitable redistribution of pollution.

Failing to achieve the final goal of preventing pollution, environmental equity was fingered as narrowing the scope of the movement. After being widely criticised, the EPA symbolically shifted its terminology, abandoning the term environmental equity and adopting a more wide-ranging one, environmental justice.

Activists and the government agencies have reached a broader consensus on the term environmental justice, especially on its two major elements, distributive and procedural justice. While the term environmental justice was employed successfully as a rhetorical device to promote the EJ movement, academic debates continue on how to situate EJ in a universal standard of justice. Seemingly, adopting an all-embracing term did not automatically settle the previous unsettled debates occurring in environmental racism and environmental equity phases.

Due to the absence of limits on the kinds of issues that environmental justice can address, researchers often impose an artificial limit on the scope of these terms. The spectrum of EJ concerns, what EJ means in practice, how terms are used to depict ideas or concepts, and the conveyance of the intended message in literature is the very thing I will inspect in the following chapters. In the next chapter, I will utilise some more cases to scrutinise the conflicts within EJ.

4 Spatialising Blackness: EJ classification and mapping techniques

4.1 Introduction

Having produced a set of feasible definitions of EJ related terms, it is now appropriate to discuss the disputes within EJ research. The institutionalisation of EJ has altered the focus of debates away from questions of its meaning and towards how we measure and prove it. This shift in focus provides a space for EJ opponents who now see the measurement of EJ not as an objective scientific process, but as one which is open to question and challenge. Recent EJ research has asserted that evidence of EJ is uncertain and that the conclusions we draw vary according to the measurements we employ (Zimmerman 1994; Downey 2005; Noonan 2008). Researches from the second- and third-wave camps add considerable uncertainty to whether evidence observed by the first-wave scholars reflects the reality of EJ. By challenging the first-wave's scientific consensus, EJ adversaries are now debating EJ's scope, its contents, and possible solutions.

In this chapter I will discuss how the key functions of the EJ examination—aggregation, demarcation and inference from census data—actually work in practice. More concretely, the spatial examination of EJ allegations comprises three key steps: determining the community of concern (the EJ community); demarcating the location and boundary of the community; and comparing the community with the reference population to determine whether injustice exists. Each step is plagued by bitter methodological disputes. Examining the spatialising process in detail, as I will do here, sheds light on the difficulties EJ advocates and officials face when making judgements about how observed EJ evidence was produced, and EJ opponents' inference of whether the evidence provided corroborates their injustice allegation. Such difficulties arise either from the classification by which advocates categorise the so-called EJ communities, or from the mapping techniques by which scholars learn to determine the boundary of such communities. This chapter thereby will elucidate why EJ is in fact fundamentally dependent on how we measure it.

In order to address this, I will first outline the process of how scholars determine which community is Black (or, ethnically disadvantaged); I then explain the modifiable areal unit problem (MAUP) and how advocates involve themselves in the "scale war". Finally, I will discuss how scholars introduced the technique of impact circles as an attempt to settle the scale dispute. In the conclusion of this chapter, I will argue that impact circles raise more questions than answers.

4.2 Not so black and white: Who is White/Black and where are they?

Thanks to EJ activists' successful campaigns, people get the impression that minority communities are systematically discriminated against by the siting process so that minorities are more likely to live in proximity to LULUs. In order to mitigate this injustice, Executive Order 12898 mandates that all federal agencies should find out where the so-called EJ communities are. Although it sounds straightforward, this is by no means an easy job.

4.2.1 Which community is Black?

Our widespread use of the term "minority community" often masks a multiple reality in which there are diverse types of communities, as well as differences within communities. When discussing minority communities most people have the impression that such a community is one in which the specified minority makes up over half of the community's population. This assumption is often correct. Take Warren County. Back in the 1980s, the population of Warren was 60% Black (see the table below). With the highest percentage of minority residents in the host state, local residents believed that the selection of Warren County as a disposal site was based, at least in part, on its predominately Black make-up. From the Warren case, the EJ movement gathered its first momentum. And, 50% was adopted as a threshold to

distinguish an EJ community from others[50].

Table 4.1: Warren County PCB Landfill: 1980 Census

Location	Population		Mean family income		Population below poverty level		
	Number	Percent Black	All races	Blacks	Number	Percent	Percent Black
North Carolina	5,881,766	22	$19,513	$13,648	839,950	14	46
Warren Co.	16,232	60	15,053	11,463	4,880	30	80
Shocco Township	804	66	10,367	9,285	256	32	90
Sandy Creek Township	1,331	70	14,009	11,806	545	41	91
Warrenton Township	4,596	61	15,812	11,746	1,360	30	90
Fishing Creek Township	1,285	44	11,454	10,296	425	33	39
Fork Township	556	81	10,897	10,378	179	32	81
Judkins Township	850	48	35,329	a/	259	31	a/

Source:(US GAO (U.S. General Accounting Office) 1983:7 (Appendix I))

It should come as a surprise to no one that, most EJ advocates and states consider the 50% definition too stringent. By definition, they argue, a minority is a smaller group of people with a different race, religion, etc. from the majority group. So, generally speaking a minority population is smaller, or much smaller, than the mainstream group. For this reason, unless the minorities are very concentrated, it is very difficult to find a community with a Black population as high as 50%. Take the US as a whole for example. According to the 1990 Census the largest racial group is White, 80.3%[51].

[50] Council on Environmental Quality also adopted this 50% threshold as one of its specifications in identifying EJ communities. (Council on Environmental Quality 1997:25-26)

[51] It may surprise some that the percentage of White population was as high as 80%. This high White percentage is caused by the so-called "Hispanic issue", i.e. the classification of Hispanics (Choldin 1986; McKenney and Bennett 1994). In general, the Census Bureau considers race and Hispanic origin to be two separate and distinct concepts; therefore, Hispanic respondents can refer themselves to any ethnic group. In practice, however, the way the Bureau designed its questionnaires significantly affect respondent's replies. For instance, in the 1990 Census, over 90 percent of people who reported Hispanic origin also reported their race as White. In contrast, only 48 percent of Hispanics reported their race as White in the 2000 census. The difference was caused by different questionnaire design. In

The second-largest is Black which, at 12.1%, is roughly one seventh the size of the White group (US Bureau of the Census 1992b). As a result, even in the South where Blacks are highly concentrated, most Black communities still fail to reach the 50% threshold; thereby these neighbourhoods will be defined as White. Apparently, the 50% threshold hinders rather than helps our understanding of EJ.

In order to properly represent, or even *maximise* the impact in the racial disparity of hazardous siting, advocates argued that there was a need for a loosening of the 50% threshold. In so doing, the 50% rule has been redefined: if the proportion of Black residents in a community is greater than that of the entire population it qualifies as an EJ community (Boerner and Lambert 1995; Lambert and Boerner 1997; Feiber 1998; Rhodes 2002). Plainly, rather than comparing a community's minority proportion with some arbitrary value, say 50%, it is better to make the comparison with the racial makeup of a wider reference population, usually the community's host area (or even the entire country).

Again, take the Warren case. This county is located in North Carolina, where Blacks made up 22% of the population in the 1980s. Since the ratio between the reference population (the State) and the community of concern (Warren County) was approximately three to one (22% versus 60%), Warren County will still be delimited as Black. In this way, the threshold for defining a Black community has dropped from 50% to 22%. Now, any community in North Carolina with a population of/over 22% Black would be classified as Black. Within this definition, what makes a community Black is no longer dependent on its absolute Black population, but largely dependent on the average characteristics of the reference population.

Once the original threshold has been loosened, advocates may demand a further drop and here begins the race to the bottom. If we compare a community's Black proportion with an even larger population, the threshold reduces further. That is, the State is not the only reference population that one can use; instead, one can choose

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the 1900 census, the race question preceded the Hispanic origin question; in the 2000 questionnaire, the order however was reversed to increase the response rate of Hispanics to the race question (Lee 2001; US Bureau of the Census 2001).

EPA regions or even the whole country as the comparison group. In so doing, an even laxer threshold emerges. Again, taking the 1990 Census as an example, since Blacks made up 12.1% of the total population in the US, a nationwide EJ study may define minority communities as those where the percentage of Black residents exceeds 12.1%. After this reclassification, the threshold further drops from 22% to 12.1%.

The practical and political implications for a laxer threshold are straightforward: it is easier for activists to claim the existence of environmental injustice. Basically, after re-defining the meaning of Black communities, the number of Black communities containing LULUs soars accordingly. Consequently, the statistical correlation between facility and race is more likely to be found in these studies. Again, take the GAO case. This study concluded that three out of four sites were located in "Black" communities.

Table 4.2: The demographics in the GAO case

	Percent Black (host community)	Percent Black (host States)
Chemical Waste Mgmt.	**90**	**26**
SCA Services	**38**	**30**
Industrial Chemical Co.	**52**	**30**
Warren County PCB Landfill	**66**	**22**

Source: (US GAO (U.S. General Accounting Office) 1983)

Obviously, the original study stuck to a strict 50% threshold. However, by adopting a laxer threshold, say the host State average for Blacks, one can further argue that "all" these sites were located in Black communities. Evidently, there are deep and relentless methodological problems with this central definition. These pitfalls soon invite criticism from the second-wave camp.

4.2.2 Too White to be Black

In the final definition, the threshold has become very flexible, as which community is Black largely depends on the reference population one employs. The problem with this is that, the choice of reference population varies from State to State and from author to author (Feiber 1998; Rhodes 2002; 2005). Partially, the reason why we have so many conflicting definitions of what is an EJ community is because each State/EPA region has been charged with developing its own set of EJ assessments. In some instances the reference population refers to a country's total population, in others it refers to a particular state. It can even be as small as the next largest areal unit, say a county. In general, the reference population is defined by each study's research scale and its purposes. It could be the non-White population of the whole nation, a state, a city, a zip-code area, etc. In short, the term "reference population" could mean almost anything (cf. Council on Environmental Quality 1997:25-26).

4.2.2.1 The Fresh Kills case

When a term is poorly defined, it attracts criticism from all sides. One widely cited case is the National Law Journal (NLJ) report. The NLJ is an organisation that has strongly supported the notion of EJ. In 1992, Lavelle and Coyle (1992) published a study on racial disparities in EPA enforcement and remediation procedures. They found that EPA levied smaller fines and it took longer to clean up contaminated sites in minority areas. In this study, Staten Island was classified as a minority community and the authors invoked it as an illustration to prove that "small fines in minority areas have been lodged against industrial giants: a $22,000 air pollution penalty against Proctor & Gamble Co. in Staten Island, N.Y." (Lavelle and Coyle 1992:S6) This may not seem altogether unreasonable until one asks: Why is Staten Island Black?

The reason Staten Island was singled out in the NLJ report was perhaps because Fresh Kills Landfill in Staten Island was a repository of domestic waste for the city of New York. Before being closed in 2001, their site was the biggest landfill in the

world. With a population of 80% White, Staten Island was the "Whitest" of New York's five boroughs (Jeffreys 1994:680-682; Boerner and Lambert 1995; Lambert and Boerner 1997:199-200). Contrary to our common thinking, what happened among these boroughs is that the White borough took in garbage and waste from the other "Black" boroughs of New York, with much higher minority populations.

Table 4.3: Population by race for New York City, Staten Island: 1990 Census

	Staten Island	New York City
White Non Hispanic	80.0	43.2
Black Non Hispanic	7.4	25.2
Asian and Pacific Islander Non Hispanic	4.3	6.7
American Indian and Alaska Native Non Hispanic	0.2	0.2
Other races	0.1	0.3
Hispanic Origin	8.0	24.4

Source: (New York City Department of City Planning 2009)

Since New York is one of the cities where its minorities outnumber the White majority, it sticks to the 50% rule[52] (NY State Department of Environmental Conservation 2003). As some second-wave commentators have noted (Lambert and Boerner 1997) it is simply "absurd" to call Staten Island a minority community. How can this White borough be considered Black? On this point, the NLJ report did not provide enough information or explanation[53]. Now, I turn to another case so as to observe the Black-White debate from the "White angle".

4.2.2.2 Observing from a White angle or a Black one?

In the context of environmental racism, "inequality" means "not equal to Whites"

[52] The same rules are applied to both New York City and New York State (NY State Department of Environmental Conservation 2003; New York City Department of Parks & Recreation 2009: chapter 27).

[53] According to Lambert and Christopher, NLJ refused to release its data set because their findings were "too controversial." (Lambert and Boerner 1997:200)

(Yamamoto and Luman 2001:347). As a result, in order to explore EJ one should focus on either the Black or the White angle. What I have discussed above is by and large centred on the Black perspective. More specifically, most cases above use the variable, proportion/percentage Black, to demarcate a Black community. However, one can also use proportion White to account for the Blackness of a community. The WMX case is one of those cases best examined from the White angle.

As has been discussed, in order to find out the racial make-up around the WMX-owned factories, this world's largest waste management company examined its 130 waste disposal units across the US. Using the same methodology applied in the UCC, i.e. 1980 Census data and the technique of zip-codes, their research concluded that "76% of its disposal facilities are located in communities having a White population equal to or greater than the host state average" (McDermott 1994:697).

Unlike other examples, this research is special for the reason that it used percent "White" as a threshold to recognise "Black/minority communities". Applying the same threshold as in WMX, now suppose there is a site in Fallsburg Town, NY; its demographics are as below:

Table 4.4: The demographics in New York State and Fallsburg Town: 1990 Census

	White	Black
Fallsburg Town	78.2	17.2
State average	74.4	15.9

Source: (US Bureau of the Census 1992:45;100)

Observing from a White angle, this community should be classified as White (78.2>74.4); yet, if one looks from a Black angle, this same community can be categorised as Black as well (17.2>15.9). Surprisingly, using the variables of percentage Black or percentage White can transform a Black community into a White one; the reclassification thereby changes the evidence of EJ. By changing the

meaning of what constitutes Black/White, researchers can easily shift their EJ findings as well.

By exploring different meanings of a Black/White community, we develop a fuller understanding of how the evidence of EJ is constructed. From the case above, it is evident that a community may be categorised as Black even though the vast majority of its residents are White. The lack of clear definitions of Black and White is just one of many problems encountered in identifying EJ communities. One related issue regarding the definition of EJ communities concerns where these communities are. For example, some definitions of community involve a specified spatial area; this geographically defined area unavoidably has boundaries that include those within and exclude those without. The drawing and redrawing of such boundaries are usually fuelled by a variety of factors, such as race, politics and the availability of public services (Fahsbender 1996). I now turn to explore the debate over demarcating boundaries.

4.3 MAUP: How to lie with scales

4.3.1 What is MAUP?

EJ research has two salient features: the risks under analysis and the spatial scale of the study. Regarding the latter, the modifiable areal unit problem (MAUP) is a troublesome issue for almost all quantitative studies (Openshaw and Taylor 1979; Openshaw 1984; McMaster, Leitner et al. 1997; Herod and Wright 2002; Sheppard 2002; Schlossberg 2003; Most, Sengupta et al. 2004; Sheppard and McMaster 2004; Wong 2004; Struthers and Erickson 2006; Dark and Bram 2007). MAUP is so-called because the boundaries of most spatial units are demarcated artificially; and such man-made boundaries are changeable.

Since boundaries can be easily drawn and redrawn to serve researchers' needs, for any given area several demarcations are often available. For example, administrative districts, zip-code areas and census enumeration units can all be found in any given region and they are all subject to being redrawn if needed. When data are gathered

according to different boundary definitions (units), various datasets are generated. Using different datasets for the same analysis can provide different results. For this reason, the selection among various geographical scales is crucial and contentious since as the scale changes, the data values and thereby the statistical inferences for EJ also change.

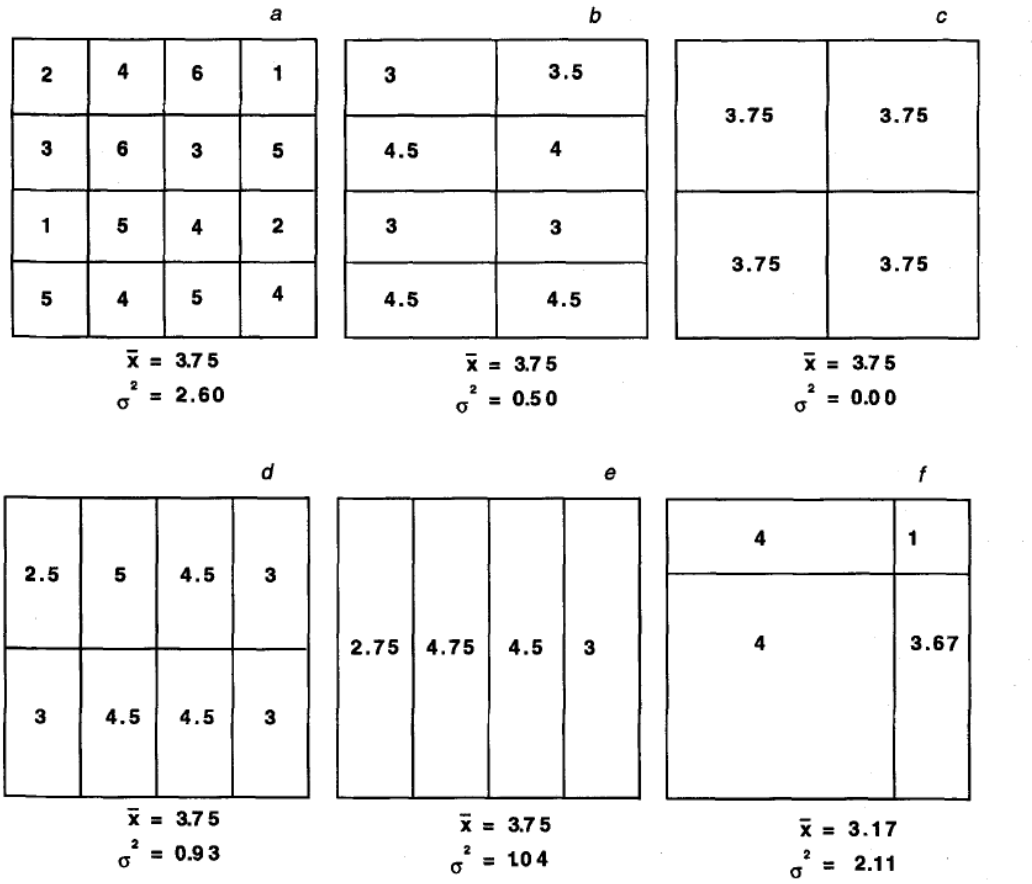
The components of the MAUP can be further divided into two parts: the scaling effects and the zoning effects (Carroll 1995; Jelinski and Wu 1996; Marceau 1999; Marceau and Hay 1999; Sui 1999; Marston 2000; Wong 2004; Manley 2005; Swift, Liu et al. 2008). Different levels of (dis)aggregation result in what is known as the scaling effect. More specifically, in a given region researchers can aggregate smaller areal units to form larger units, fewer in number, to cover the study area. When the total number of units decreases, the spatial resolution of the data are lowered as well. Conversely, a researcher can also break the larger units into smaller ones. By so doing, data from the larger units can be reasonably disaggregated.

The second component of the MAUP is concerned with zoning (or gerrymandering). Zoning refers to the re-demarcation of boundaries. That is, once the number of areal units in a given area is somewhat consistent, one can draw new boundaries to create new zoning systems. Unlike the scaling effect, the process of zoning is not simply disaggregating a given unit configuration into smaller sub-units. This process attempts to divide the region into disparate areal units. Given that zoning creates new areal systems, its effects are largely dependent on the method of zoning and the distribution of values; thereby, its impacts are less predictable. In most cases, zoning a given area differently affects the variance observed in values across areal units. In general, if a zone is formed from areas where their values are similar, then the underlying variance may be amplified. In contrast, zones drawn to enclose clusters of dissimilarity can disguise the underlying variance. This is the essence of the MAUP.

Using a simple figure, Jelinski and Wu (1996:131) illustrate how the MAUP influences the performance of quantitative data in a spatial study. It is clear from their illustration that both the contrived scale and zoning affect the mean and

variance.

Figure 4.1: The scaling (aggregation) effect and zoning effect



Source: (Jelinski and Wu 1996:131)

In this example hypothetical data about a population is aggregated into different areal units. One can see the effects of aggregating areal data from neighbouring zones. For the a-c group, while their mean values remain the same, the variance (δ^2) declines with the aggregation. In other words, in the a-c group information on spatial heterogeneity is lost or distorted. Conversely, in the d-f group the units are aggregated into zones with various orientations. In this example, zoning produces the more complex situation. For d and e, no change can be found in the mean, but the variance changes substantially as a function of location. Comparing c, e and f, it is clear that even when the number of zones is held constant (N=4), both the mean and the variance are changed with zoning. Moreover, by comparing parts b and d, one

can see a change in variance when the orientation is altered, but the size of the units remains fixed.

From this simple illustration, some general patterns of the MAUP can be identified. First, by comparing a-f, one can see that zoning and aggregation techniques can influence the mean and the variance. Second, while the mean is unchanged by aggregation (scaling), the variance declines. This phenomenon is caused by the fact that information is lost with aggregation. That is, enlarging the scale (lowering the number of spatial units) causes information loss; conversely, shrinking the scale (increasing the number of units to heighten the resolution) leads to an increase in observed variance. Third, zoning effects are much more unpredictable than scaling effects because both the mean and variance may be affected (Dark and Bram 2007).

The MAUP is extremely important for us to comprehend "the scale war" among different waves (Been 1995; Mohai 1995; Bowen and Wells 2002; Taquino, Parisi et al. 2002; Noonan 2005; Fisher, Kelly et al. 2006; Bullard, Mohai et al. 2007). Specifically, EJ analysts use various resolutions, such as administrative districts, zip-codes, or census tracts, to examine the distribution of facilities in a given region. As discussed, changing the scale affects the mean, the variance, or both, in the observed area because of the zoning and scaling effects. Shifting the scales may change the research results. One of the major contributions that we can learn from the MAUP is that it urges us to ask questions about how one decides which scale/dataset to use. A related issue is to what extent EJ findings depend on the chosen scale/dataset. More fundamentally, can we identify one unit over another as being most appropriate to detect spatial patterns of LULUs?

4.3.2 The scale war: Zip-codes vs. Census tracts

After a successful EJ campaign, the federal government and some state legislatures established policies to alleviate environmental inequity in the US. Such policies are essentially based on an assumption that in a given jurisdiction environmental injustice not only exists but is widespread. The problem with that is, according to the

legislatures, these authorities have to scientifically prove EJ's presence and its scope before taking any actions. A fierce debate soon raged over the political implications of scale frames in the construction of EJ grievances. After all these years, a clear consensus is still lacking over the spatial ambiguity of what is the best scale for measuring EJ.

The turning point came with the second-wave in which researchers started to confront the first-wave consensus. These contenders posed a series of challenges. For one thing, they contest the suitability of zip-codes for testing EJ. For another, the extent to which the chosen scale affects EJ findings was critically scrutinised. They argued that the scope and contents of EJ are largely determined by the researchers' selection of scales. This selection pre-determined the nature and extent of EJ.

As I have noted, the second-wave researches tend to use different research frameworks from first-wave ones. In so doing, EJ's content has shifted from a racial perspective to an income one; its scope has also been redefined from a national problem to a local one. Through scale shifting, a nationwide EJ phenomenon can be easily downplayed as if it is only occurring at a local level; similarly, the presence and absence of racial/income disparities can also be cloaked via their scale selections (zip-codes vs. census tracts) (Kurtz 2003). These divergent findings can then be further translated into different interpretations of causal analysis. In essence, the "scale war" has become synonymous with the politics of EJ.

There are two units usually found in the literature: zip-codes and census tracts (Fahsbender 1996; 1999a; Williams 1999b). One common analytical unit is the zip-code. The UCC case exemplifies the wide espousal of this analytical unit among the first wave allies. It goes without saying that zip-codes are designed to facilitate the US Postal Service's system for mail delivery. The whole territory of the US is identified by five-digit zip-codes which designate geographic units in which mail can be received. Since zip-codes are devised as an administrative convenience for mail delivery, they do not necessarily respect political boundaries. Also, the demarcated areas are not necessarily uniform in size, population, and density (average 86.19

square miles[54] and with around 30,000 people). Of course, zip-code areas are also subject to change (Fahsbender 1996; Williams 1999b; US Bureau of the Census 2000; Krieger, Waterman et al. 2002; Grubesic and Matisziw 2006).

The theoretical rationale for using this analytical unit is evident. On the one hand, this unit is an adequate representation of the community under study. On the other, its five-digit numbers provide an operationally simple and familiar way to define communities in terms of the zip-code area. Specifically, zip-codes provide the locals with a clear mind map over their local landscapes, since most US citizens know their zip-codes well. Concretely, without consulting a map residents can still easily indicate the spatial relation between their backyards and the nearby LULU. Also, as seen in the UCC case, even though they do not necessarily correspond with political boundaries, such as cities, counties, or states, the zip-code areas are considered small enough to represent a community and its boundaries. Once the boundary is delimited, researchers can then collect demographic data accordingly. Thus, zip-codes are considered to offer good approximations of community (Williams 1999a; 1999b:319 ff.).

The practical rationale behind the use of zip-codes is based on data availability. These codes offer a useful way to partition a region in terms of geography and demography. As a result, the US Census Bureau also tabulates demographic data according to zip-code areas. By using the same analytical unit as the Census Bureau, no data transition is needed; comparable spatial and demographic data are readily available. Moreover, zip-codes also provide an easy way to determine the position of toxic facilities (Williams 1999a; 1999b:319 ff.; US Bureau of the Census 2000).

The other commonly-used unit of analysis is the census tract. Census tracts are an official unit that the US Census Bureau uses to aggregate the basic data of the American population every ten years. A census tract, as defined by the US Census

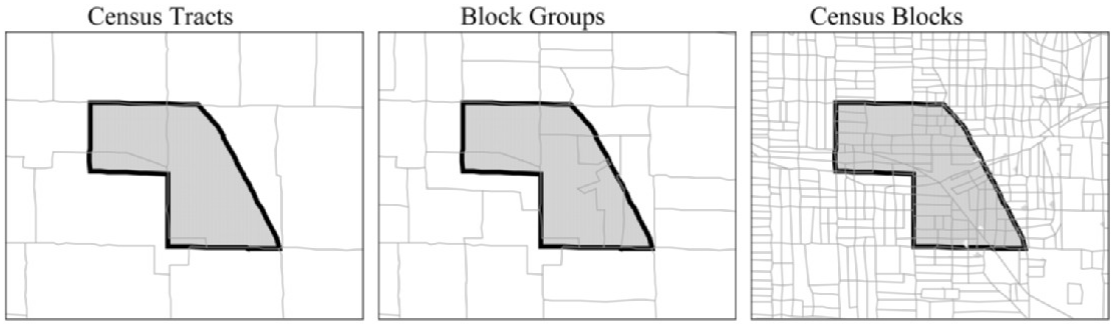
[54] A difficult associated with zip code areas is the significant variation in geographic extent. For instance, in Wyoming the average size of a zip code area is 552 square miles. In a more heavily urbanized New Jersey, the average size of a zip code area covers only 12.8 square miles (Grubesic 2008:130).

Bureau (2005:G10-G11), is a statistical subdivision of a county and it is designed to be relatively small and homogeneous (median 0.74 square miles and with around 4000 people) . That is, at the time of establishment, census committees deliberately delineate residents who share similar population features, economic status and living conditions into the same tract (Fahsbender 1996:130-134; Fisher, Kelly et al. 2006:703). For this reason, demographic characteristics within a tract are rather similar. Conversely, settlement patterns fluctuate from tract to tract. Moreover, census tract boundaries are intended to be consistent over time to facilitate comparison from census to census. Census tracts are not usually split or combined, except when significant population moves occur. Because of its homogeneity and consistency, most second-wave scholars and the court insist that the census tract is the most appropriate unit for testing EJ (Anderton, Anderson et al. 1994; Been 1994a).

In a similar way to zip-codes, the theoretical rationale behind applying census tracts in EJ is that they provide good, if not better, approximations of community (see below). According to SADRI, this analytical unit is smaller in area than zip-codes. Therefore, when census tracts are applied to aggregate the territory of a community, they establish a closer simulation of the community and thereby provide more detailed information (high resolution) about the target areas. For this reason, it has been suggested that one should always use “the smallest available scale” (Noonan 2008:1159). More concretely, it is believed that researchers should always follow the first law of geography, “everything is related to everything else, but near things are more related than distant things.” (Cited from Bowen, Atlas et al. Online First: Online First) So, the spatial unit of analysis should reflect the environmental risk as closely as possible. As a result, it is argued that smaller is better.

To explain why smaller is better, one should consult a map. The map below shows the census statistical sub-units, block groups and blocks, within a tract:

Figure 4.2: The relationship between tracts, block groups, and blocks



Source: (Schlossberg 2003:215)

Suppose the grey zone is our research target (or an impact area). As one can see, it intersects three tracts. When one chooses tracts as an analytical unit, the impact area unavoidably contains data from the unenclosed area of an intersected tract. To a large extent, these unwanted data influence our findings. If blocks are used as the unit of analysis, then one can more accurately aggregate these blocks to simulate the impact zone. In this light, the smaller scale is better. Nevertheless, data at block level are not always available since block numbering areas are essentially designed for *non-metropolitan* counties. Therefore, if the target LULUs are in urban areas, the smallest unit for which data are available is the census tract. By using a smaller unit, argues SADRI, researchers avoid the shortcomings of encompassing too much territory which does not constitute a community (or not encompass the affected area in this example).

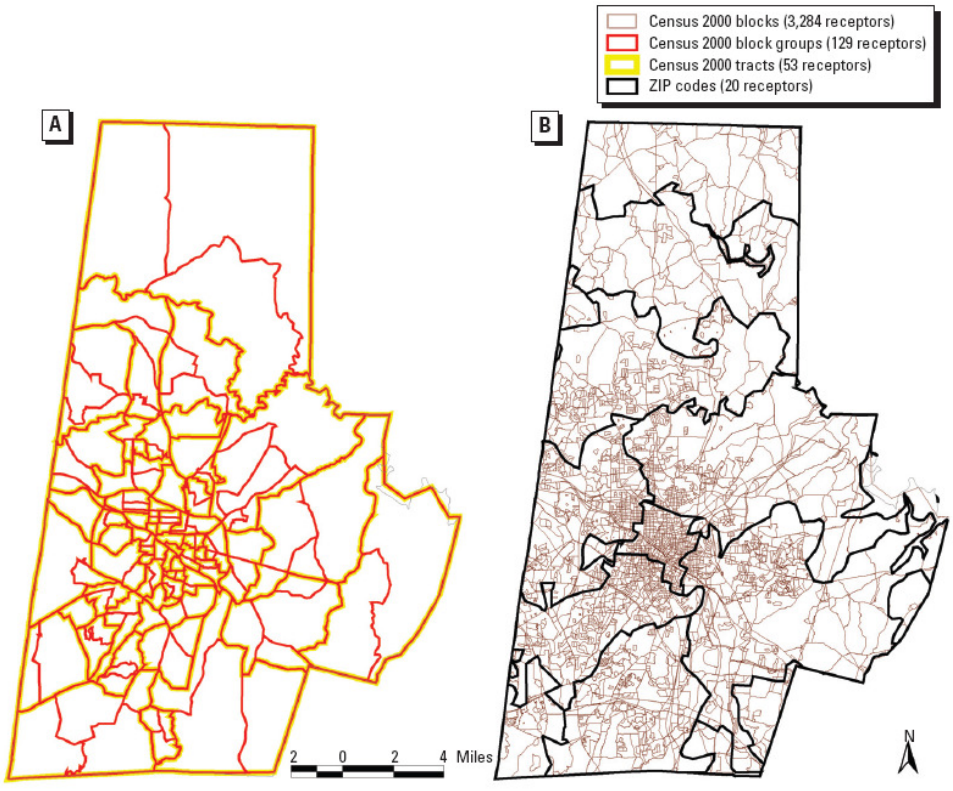
Since a broad range of information is readily available, the practical advantage of census tracts is clear. The use of census tracts however presents a dilemma with data suppression. When gathering data within a smaller unit, confidentiality may become a problem in detailing certain variables. This is particularly true of racial variables. For a smaller unit, specific individuals can be easily identified; therefore data may be suppressed to maintain the confidentiality of respondents (Williams 1999a). In summary, when conducting small scale analysis, a compromise must be made between the size of the area and the range of the data.

4.3.3 Getting the scale right

After comparing the advantages and disadvantages, it should be noted that zip-codes and census tracts have quite a few common characteristics. The most significant difference between zip-codes and census tracts is their scales. When there is more than one scale available, the MAUP emerges. Below is a sketch of how the MAUP affects EJ results.

From the Figure, it is apparent that for a given area, new boundaries can be drawn to create new zoning configurations. Correspondingly, data gathered according to these different partitioning systems are also likely available. When two datasets are readily available, using them for the same analysis generally yields inconsistent analytical results.

Figure 4.3: Boundaries for Durham County, North Carolina



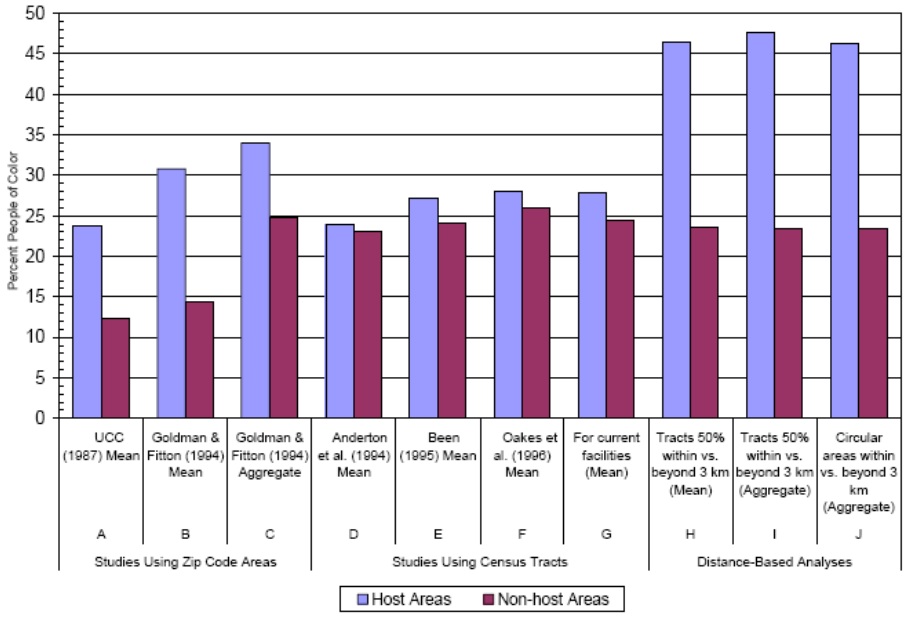
Source: (Dolinoy and Miranda 2004:1719)

Here, panel A shows census tracts; panel B shows zip-code areas. For a given region

the number of census tracts is usually more than that of zip-codes. In this specific case, the number of census tracts (53) is as much as 2.7 times greater than that of zip codes (20). When the target area is held constant, the more units it has the smaller area these units can capture. For this reason, most zip codes are spatially larger than census tracts (Zimmerman 1994; Mohai 1995; Taquino, Parisi et al. 2002).

The MAUP arises because of the scale dependency in the EJ analysis. MAUP here refers to the possibility to choose different spatial units (zip codes or census tracts) to examine the same event or area. Take the UCC and SADRI debate. SADRI asserts that their study is a replication of the UCC research; the only difference is that the analytical scale in SADRI is census tracts rather than zip-codes. After redoing the UCC research, SADRI found that when shifting the scale of analysis from zip-codes to census tracts, the previous correlation between hazardous facilities and race disappears. Since no correlation can be found, by definition the condition of "injustice" is absent as well. It is rather clear that the existence of EJ is inconclusive and very sensitive to the chosen scales of analysis.

Figure 4.4: Comparing results of past studies



Source: (Bullard, Mohai et al. 2007:44) [55]

[55] For the a-c group, these zip-code-based studies suggest that LULUs are more likely to be sited in places with more minority populations. Conversely, from a census tract analysis (the d-g group) no

Table 4.5: Minority percentage in three different tests

	Unit-Hazard Coincidence Studies Using Zip Code Areas			Unit-Hazard Coincidence Studies Using Census Tracts				Distance-Based Analyses		
	A	B	C	D	E	F	G	H	I	J
	UCC (1987) (Mean)	Goldman & Fitton (1994) (Mean)	Goldman & Fitton (1994) (Aggregate)	Anderton et al. (1994) (Mean)	Been (1995) (Mean)	Oakes et al. (1996) (Mean)	For current facilities (Mean)	Tracts 50% within vs. beyond 3 km (Mean)	Tracts 50% within vs. beyond 3 km (Aggregate)	Circular areas within vs. beyond 3 km (Aggregate)
Percent People of Color in Host Areas	23.7%	30.8%	34.0%	24.0%	27.2%	28.0%	27.9%	46.5%	47.7%	46.2%
Percent People of Color in Non-host Areas	12.3%	14.4%	24.7%	23.0%	24.2%	26.0%	24.4%	23.6%	23.5%	23.4%

Source: (Bullard, Mohai et al. 2007:47)

Calling into question the mainstream EJ assumption that environmental injustice has been scientifically proved, SADRI made a novel claim: the conclusions we draw vary according to the scales we employ. After the SADRI study, the scale issue soon sparked considerable debate and later became a "scale war" within both the movement and academia (Zimmerman 1994; Mohai 1995; Cutter, Holm et al. 1996; Most, Sengupta et al. 2004; Downey 2005; Baden, Noonan et al. 2007; Noonan 2008). Scholars disagree on what unit of analysis researchers should employ to obtain the most accurate results possible.

Between the first and second waves, the selection of analytical unit resulted in entirely different outcomes. Generally speaking, larger scales (i.e. zip-codes) suggest stronger statistical correlations between race or income and LULU's spatial distribution; conversely, smaller scales (i.e. census tracts) lead to weaker correlation. Both sides accused their counterpart of committing some serious methodological mistakes. Ecological and individual fallacies are the most common rhetorical ammunition in an EJ MAUP debate.

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such evidence can be found. As one can see, the percentages of people of colour in host and non-host areas are very close in the d-g group; therefore, the condition of injustice does not exist. Here, I focus on unit-based methods (zip-codes and census-tracts) only. Distance-based methods (h-j) (impact circles) will be discussed later in this chapter.

4.3.4 Nobody is correct: Ecological fallacy vs. individual fallacy

The UCC study concluded, from a zip-code analysis, that toxic facilities were disproportionately sited in relation to specific social factors (low income or/and Black social groups). However, when SADRI repeated the UCC study, using the smaller census tracts as their scale of analysis, no such association could be found. So the SADRI brought an accusation of ecological fallacies against the UCC.

> Because geographic data can be aggregated to produce information on larger regions, it seems reasonable to begin with an analysis of areas that are as small as is practical and meaningful. Beginning with too large a geographic unit invites the possibility of "aggregation errors" and "ecological fallacies"; that is, reaching conclusions from a larger unit of analysis that do not hold true in analyses of smaller, more refined units. (Anderton, Anderson et al. 1994:232)

An ecological fallacy is when a researcher makes an inference about an individual on the basis of aggregate data for a group. In other words, this fallacy assumes that individual members within a group must have the average characteristics of that group at large. For example, if a particular group of people, say Black people, have a lower than average wage, it is a mistake to assume that all Black people have a lower wage. In fact, for any given individual Black, there is no way to know, unless asking directly, whether that person has a lower or higher wage than the average of the general population (Babbie 2005).

The MAUP is closely related to the topic of the ecological fallacy. In the context of EJ, the ecological fallacy is the situation in which researchers incorrectly draw conclusions about smaller groups based on an observation of larger spatial units in which general patterns are found (Mohai 1995; Cutter, Holm et al. 1996; Babbie 2005:102-104; Mitchell and Walker 2008). This kind of ecological reasoning is dangerous because a certain pattern learned from a larger group/unit level might in fact say nothing about the pattern in the smaller groups/units or individuals that make up the larger group/unit. So, if a piece of research is only conducted at a certain level, say zip-codes, in effect we could not know for sure whether or not the

pattern can be found at a smaller level, say census tracts. For this reason, the UCC study stands accused of committing an ecological fallacy because it simply assumes that their observed patterns will recur at another analytical scale. This assumption was not tested. Concretely, even though UCC's research was conducted at the zip-code level only, their conclusion implies this pattern is prevalent so that similar patterns at another observational level can be inferred from it. SADRI disproved this assumption.

Ironically, when the first-wave fought back, they accused the SADRI authors of committing the "individual fallacy", the very opposite of the ecological fallacy (Mohai 1995:626-628). Here, the error is "inappropriate extrapolation". The individual fallacy is the assumption that something learned from an individual case can be generalised to all other similar cases. For example, if you know someone who has become rich without a college degree, that does not deny the general pattern that people with a college degree normally have higher income (Babbie 2005:102-104).

In the EJ context, researchers may incorrectly use the results drawn from one case study to infer patterns of injustice for other places, times, or situations (Mitchell and Walker 2008). The risk of an individual fallacy is that the observed case may be simply an individual exception; thus it says nothing about the other cases or the larger group that the individual belongs to. In this fashion, having one or two studies suggesting that EJ does not exist does not mean that the identifying associations are meaningless. What it does say is that the MAUP may conceal variations that are not visible at the larger level, and that researchers should be more careful.

This argument echoes the suggestion from the originator of the MAUP, Openshaw (1984; Taquino, Parisi et al. 2002; see also Struthers and Erickson 2006), that the easiest way to solve the MAUP is simply to "pretend" it does not exist. Openshaw suggests that researchers can ignore the MAUP totally and "hope" the end result of the analysis is still meaningful (Openshaw 1984:31). No matter which units are selected, so long as the research results are put into a meaningful statistical and spatial context, in some way the end result should still be relevant to the observed

characteristic, even though a consensus cannot be achieved on issues. As a result, for the first-wave, the MAUP reminds researchers to be more careful and reflective about their data. However the MAUP does not in any way compromise the strong evidence for EJ and one should not use MAUP as an excuse for not taking actions.

Moreover, according to the first-wave allegiants, several individual fallacies can be founded in the SADRI study as well. These fallacies revolve around exclusion and inclusion. For instance, the SADRI authors claimed that some census tracts should be excluded from the dataset of the control population, because these tracts are regarded as not suitable for a toxic substance disposal facility (TSDF):

> [These areas] arguably were not feasible sites for the TSDFs. This Strategy [to exclude some census tracts from the database], for example, might tend to exclude national parks, rural areas without any transportation facilities, cities without an industrial economy that would require local TSDF services, etc. (Anderson, Anderton et al. 1994:92)

The decision to exclude some tracts has profound methodological implications and these implications are critical for explaining the conflicting findings and conclusions between SADRI and UCC. Briefly, although SADRI asserted that its study is a replication of the UCC, in reality these two studies are not quite the same. This directly contradicts the claims of SADRI, who attribute their different findings to the choice of units of analysis. It is true that SADRI's analysis compared the average characteristics of census tracts with facilities against those census tracts without facilities (the comparison group). However, SADRI limited the number of census tracts in its analysis; quite a few tracts were excluded from the comparison group. It eliminated all tracts outside of what the Census Bureau defined as Standard Metropolitan Statistical Areas (SMSAs). Also, tracts *inside* the SMSAs, where no facilities existed within the SMSA boundaries, were also excluded. Overall, 32% of all available tracts were excluded from the SADRI analysis (Mohai 1995:620). Evidently, the scope of SADRI is distinctly different from that of UCC. For SADRI, its research target is the metropolitan areas; the UCC study however focuses on the whole nation.

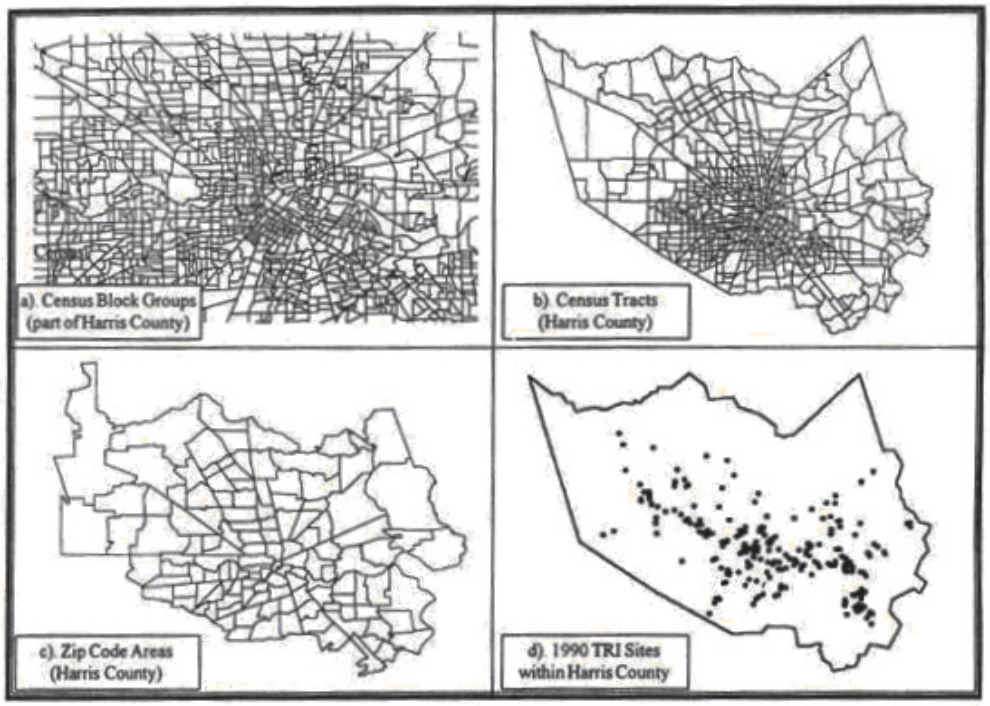
The first-wave scholars refuted SADRI's strategy of excluding some tracts from the comparison group by arguing that this exclusion scheme invites the individual fallacy. For instance, locations in a rural area or in proximity to a national park are excluded from the SADRI study because these are considered inappropriate for a TSDF. However, areas like these do not necessarily disqualify them from being considered for dumping waste:

> … [I]t is not at all obvious that all rural areas (whether or not they currently contain a TSDF) and all the SMSAs not currently containing a TSDF are otherwise not potentially suitable for one. (Mohai 1995:625;brackets in origin)

Several cases can be found to verify this assertion. Warren County, arguably the most famous EJ case, is rural. Nevertheless, in the GAO report, the North Carolina government justified its siting decision by arguing that Warren is "isolated from highly populated areas." In other words, the rural nature of Warren was the very reason that it was ostensibly chosen for dumping. Similarly, location in or near a national park does not mean that this area is automatically excluded from being considered as a dump-site candidate. For instance, the US government seriously considered siting its first high-level nuclear waste repository within one mile of Canyonlands National Park in Utah (Mohai 1995:626). So, it is rather misleading to assume, the first-wave researchers argued, that *all* rural areas or *all* national park surroundings are so unsuitable for a site that these areas should be excluded from the dataset.

Another individual fallacy within SADRI concerns the presumption that census tracts are always smaller than zip-codes. The first wave advocates stressed that one should always consult a map before jumping to conclusions.

Figure 4.5: Harris County, Texas



Source: (Sui 1999:46)

As the census map (b) above indicates, census defined units vary considerably in size and shape. In general, tracts become smaller in size as they get closer to the central cities. In urban areas, the radius of a census tract could be as small as one-quarter mile or less (Mohai 1995:630). In rural areas, the map depicts a completely different story in which the tracts tend to be fairly big in size. Given that zip-codes do not respect county boundaries, it is a mistake to conclude that compared to zip-codes, tracts are *always* smaller. For the first-wave brigade, to say that tracts are always better than zip-codes is nothing but an individual fallacy (or just a fallacy!).

4.3.5 A very third-wave solution: The only way to solve the MAUP is to abandon EJ altogether

Although there are a number of resolutions to the problem of defining geographical data, most researchers choose only one specific unit of analysis whilst ignoring other possibilities. Each scale addresses different types of question. The original approach

favours the "scale appropriate to the impact"; conversely, the second-wave observers favour "the smallest available scale" (Noonan 2008:1159). Nonetheless, both camps construct their measures on the particular scale which they think most appropriate. Even if it is possible to agree on a unique set of scales, statistical variation in EJ will continue to be of interest in order to place a set of results into a meaningful statistical and spatial perspective. A lack of consensus makes it extremely hard to turn EJ findings into useful information to aid decision-making. For this reason, disagreements soon emerge and debate arises as to whether more information is really better than less.

Instead of using one agreed most appropriate scale, the third wave scholars tend to use a series of scales to demonstrate the sensitivity of EJ research to the MAUP. Once the third-wave critics roll up to join the debate, they often make things even more complicated. In a Superfund site study (Baden, Noonan et al. 2007; Noonan 2008), researchers repeated their models four times, once at each of four scales commonly used in EJ research. They then further apply each of these models to the analysis of three different target areas to see if the presence of the MAUP will offer different results. The table below summarises their key results:

Table 4.6: An example of MAUP

		Unit of Analysis			
	Variable	County	Zipcode	Tract	Block Group
Nation	% Black	+*	+***	+***	+***
	% Hispanic	−*	+***	+***	+***
	Income	+	−	−***	−***
State (California)	% Black	+	+	+***	+***
	% Hispanic	−	+	+***	+***
	Income	−	−	−	−
Local (LA County)	% Black	n/a	−	−	−
	% Hispanic	n/a	+	+*	+***
	Income	n/a	−	−**	−**

+ Positive relationship; − negative relationship.
*Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent.
Dependent variable: an NPL site located in the area.

Source: (Noonan 2008:1159)

From this example, it is hardly surprising to see how inconsistent the story is. At the national level, the table identifies significantly higher probabilities for Black people to host a site across all four scales. Looking more closely however, it is evident that at county scale the evidence of injustice is weaker than that at other scales as the coefficient is significant only at the 10% level. For percent Hispanic, the result is even more dramatic since the evidence of injustice is reversed when moving to the county scale of analysis. In other words, at the 10% level counties with greater proportions of Hispanics are *less* likely to host Superfund sites. For the analysis of income groups, both justice (reverse injustice) and injustice can be found, and evidence suggests that poorer communities are more likely to host Superfund sites only at the smaller scales. The California and LA sub-samples were found to suffer similar inconsistencies. In summary, the evidence on EJ is not consistent across scales.

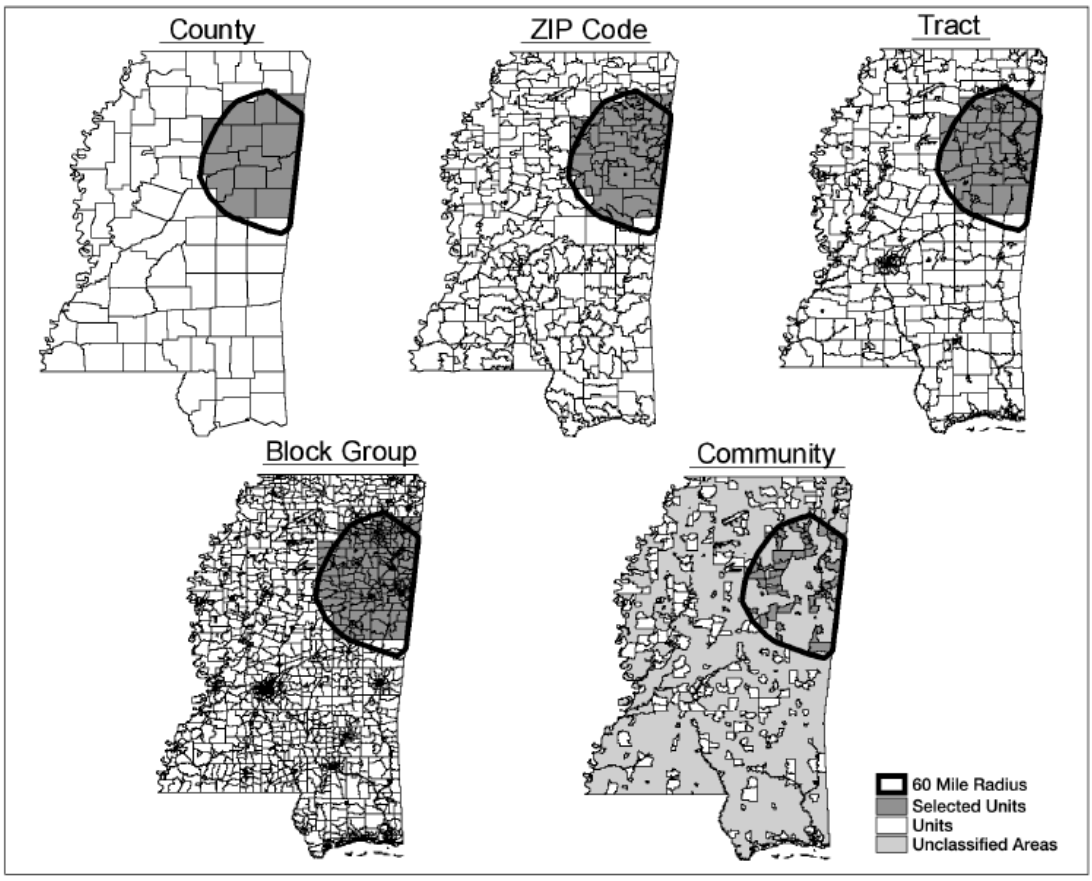
The findings can be even more contradictory, as one can further combine this sensitivity test with multiple model tests. That is, for any given study area, data with multiple scales can be analysed through multiple statistical models. Mixing the sensitivity tests with multiple models, the combined effects make the already complex findings even more so. The case of industrial hog/pig farms offers an excellent illustration of this (Taquino, Parisi et al. 2002).

Similar to the above-mentioned sensitivity test, this study outlined the effects of the MAUP across scales (i.e. county, zip-code, census tract, block group). Further, the identified community area was then compared through a bivariate [56] and a multivariate[57] logistic regression. This research confirms the combined effects of the MAUP and analyses made with multiple statistical models. When combining the sensitivity test with two models, the results depict an even more contradictory story. Below are their key EJ-related results.

[56] This analysis was design to understand the relationship between each independent (race, income, college education, and industry employment) variable and the presence of hog farms. The authors only listed the most important EJ variables (race and income) in the table below. The results for other variables can be found in their article. See: (Taquino, Parisi et al. 2002).

[57] This was to determine whether or not the bivariate relationships held when the other variables were controlled.

Figure 4.6: Selected geographic units of analysis



Source: (Taquino, Parisi et al. 2002:303)

Table 4.7: EJ variables for hog industry in Mississippi across units

	Bivariate Analysis		Final Multivariate Analysis	
Units	Race	Income	Race	Income
Census block	Yes	Yes	No	No
Census tract	No	Yes	No	No
ZIP code area	Yes	Yes	No	Yes
Community	Yes	Yes	No	Yes

Source: (Taquino, Parisi et al. 2002:313)

On the one hand, the bivariate test shows that both income and race are significant

indicators for predicting hog/pig harms. The only exception is at the census tract level where race was not statistically significant. Their multivariate test, on the other, portrays a completely different picture. In this model, race was the only variable that consistently shows *no significance* across all units. For the income variable, results were mixed across units. This study confirms that statistical results vary across scales and models.

Quite often, the goal of EJ analysis is to identify patterns directly related to individual situations. For instance, a researcher may concentrate on zip-code level only. Due to the MAUP, his/her findings in this single case cannot provide a consistent picture for another situation/scale. Since the empirical evidence is quite mixed, it could be erroneous to infer individual situations based on ecological data. When confronted with these inconsistent results, what are EJ policymakers supposed to do (Rhodes 2005; Noonan 2008)? To what extent should policymakers take actions to tackle EJ?

The substantive findings themselves cannot offer the answer to these questions. Unsurprisingly, people from different camps provide completely different interpretations on this matter. EJ advocates are more likely to support the standpoint that as long as evidence is not biased in the construction of spatial variables, we should still do something to correct the possible injustice (Mohai 1995; Tesh and Williams 1996). Its critics, however, do not share this thinking. The third-wave contenders have gone as far as suggesting that EJ be abandoned altogether. For one thing, it is argued that EJ is typically a central concern in environmental policy already. As a result, they argue, there is no need to brand something EJ and then take it outside the core of all policy considerations (Noonan 2008). For another, as Bowen (2001) has long argued, since we know so little about EJ, we should wait until all data are in. Without solid evidence, investing on any EJ issue will be considered a waste of public money. The problem is that, this view can be easily distorted as a philosophy of doing-nothing. The third wave allegiants themselves proved that the data will not tell us much. If that is the case, EJ victims are forced to face with an endless wait for action.

4.3.6 Scale frames: Issue definition and the ambiguous mandate among agencies

Although the scale war sounds like an ivory-tower debate, in fact each scale choice addresses different types of collective action frames. These "scale frames" link the scale at which a social problem is experienced with the scales at which it could be politically addressed or resolved (Benford 1997; Ringquist and Clark 1999; Williams 1999a; Herod and Wright 2002; Kurtz 2003). Specifically, in order to frame EJ, scholars have to make a meaningful link between the social problem (EJ) and responsible agencies. In order to examine the relationship between EJ problems and activists' courses of action, Kurtz (2003:894 ff.) identifies three "scale idioms": the scale of regulation; as a means of inclusion/exclusion; and as an analytical category. Here, Kurtz sought to explain the way activists' collective actions are developed around these scale idioms, and further, the way scaled relationships are invoked or deployed. These idioms are overlapping and inform one another in the construction of scale frames. In the context of EJ, they are used to articulate the meaning, extent and implications of EJ.

For most of us, the most common scale idiom is the scale of regulation. Most political debates over scales relate to the issues of jurisdiction. That is, before taking actions, authorities have to decide whose territory the problem is in and accordingly which government agency should administer this problem. By appealing to different tiers and agencies of government, EJ activists could exploit territorial scale to make claims for resources; conversely, its opponents could also use the scale of regulation to redefine the scope of EJ. In this fashion, both activists and their targets could be considered as attempting to "force struggles to the geographical scale at which political opportunity structures seemed most favourable to them at the time" (Miller 1994: 404). EJ activism is critically shaped by the opportunities and constraints of this scale idiom, because legal and regulatory frameworks for civil rights and environmental protection exist at different scales (Kurtz 2003:895). Shifting scales is a way to gain resources and momentum.

Secondly, scale frames provide a legitimate device to include or exclude participants in political debate. Legitimating exclusion refers to the way a social or political group defines a social grievance so as to limit the afflicted population. Conversely, legitimating inclusion is the way local groups reshape or expand their local grievance to a regional, national or even a global level (Jones 1998; Herod 2009). In many cases, this function of inclusion or exclusion attaches to existing political or administrative boundaries. In other cases, the territorial boundaries are not so obvious. It is especially the case when the community is very big. In order to include all members from this community, scholars have to reshape the original territorial or demographic boundaries[58]. When re-framing these boundaries, some people are included while others are excluded (Kurtz 2003). For example, if Warren County is defined as a local incident, very few people are involved; however, if we consider it as the tip of the iceberg for environmental racism, then all Blacks are included in the Warren struggle.

The final scale frame is the scale invoked as an analytical category. Most cases cited in this chapter fall into this category. By underscoring the specific relevance of scale, units of analysis are nearly always involved in identifying the aggrieved population. Researchers in each wave insist that their choice of scale best reflects the underlying reality. However, it should be noted that any given scale includes some people while excluding others from their EJ scheme. Therefore, through the practices of both academic and bureaucratic spatial analysis, one can challenge and then redefine the existence, extent and severity of EJ. As noted in the Bullard-Been debate, researchers tend to use different spatial measures to describe their research target. By so doing, some impacted groups, say ethnic or income groups, will be methodologically excluded from the aggrieved population.

Applying these scale idioms to the scale war, it becomes clear that both the second-

[58] To some extent, the first two idioms are rather similar. In effect these two idioms are two sides of the same coin. The former is focusing on the way activists attempt to gain resources from the scaled outside world. In so doing, the movement reshapes the problem of EJ to include/exclude the afflicted population, which is the main function of the latter.

and third-wave scholars have an explicit policy ambition. By adopting the techniques of census tracts and multiple analyses, these camps restrict EJ to a smaller scope. That is to say, through their research frameworks, EJ evidence tends to be restricted to local levels. If EJ is only a local issue, no serious federal engagement is needed. Likewise, in most of these challenger's schemes, race is not associated with LULUs; for this reason, the issue of race and race-related civil rights arguments are excluded from the discussion.

For those confirmed cases at local levels, they have been further scaled down to suit the purposes of de-regulation proponents or neo-liberals. Under their definition, there are several dimensions of EJ; not all dimensions, it is believed, are worth the government's attention. If, they argue, the cause of EJ results from intentional discrimination, then legal or administrative authorities should remedy the discrimination. If the cause occurs in the political decision-making processes, greater citizen participation should be encouraged to ensure public engagement in siting decision. However, if the cause arises from the operation of market forces, because market forces are considered neutral, nothing can or should be done to rectify the problem (Ringquist and Clark 1999; Ringquist 2006). Under this thinking, the second-wave scholars narrowly define EJ as the non-market-driven local issue. Undoubtedly, this definition greatly restricts EJ's further development.

A market-based explanation like this has its grounding in neoclassical economics, which believes that individuals have a tendency to maximise their self-interests. This tendency, second-wave allies argue, drives the locations of individual households and firms. Put differently, the central responsibility for selecting the location for a home, factory, or landfill lies with an individual's calculation of the economic value of siting at a specific place. Since the individual is the one making siting decisions, this neoclassical economic assumption, as Williams (1999a:63 ff.) argues, implies that small scales (such as individual or household) are preferable.

The strong preference for defining EJ locally can trace its roots to the American legal system as well (Williams 1999a:57; US Nuclear Regulatory Commission 2005). As

discussed in the previous chapter, legal culpability is based on the notion that decisions are made by an atomistic, intentional, autonomous individual/corporation. To this end, the legal system itself presupposes that where the individual lives and acts is the pertinent scale to judge a person. Under this legal system, individual intent and the consequences of individual actions are judged locally; the extra-local scales or larger contexts recede from being on trial. Since it is believed that decisions are only made by individual persons or firms, this system also implies that businesses are not responsible for intentionally discriminatory actions.

After observing the scales used in different EJ waves, it is clear that:

> geographic scale is conceptualized as socially constructed versus ontologically pre-given, and geographic scales constructed are themselves implicated in the constitution of social, economic and political processes. (Delaney and Leitner 1997: 93)

The issue of the geographic scale of analysis according to which EJ was measured and regulated has explicitly revealed the artificial nature of the area units. Nonetheless, being artificial, as Williams (1999a:319) noted, does not necessarily mean being arbitrary or mean that various criteria share no common characteristics. What it does show is that scale itself plays an important role in shaping the responses and the extent of EJ, even though its role is not always problematised by scholars (Kurtz 2003). For instance, although the market-based explanation has a tendency to privilege the local scale, this scale choice was treated as a given, and thereby some vital EJ factors lying at national or global scales were ignored or even de-legitimised. This economic approach may be suitable under the US legal system; however it has limited, rather unnecessarily, our understanding of EJ. If the injustice occurs at the non-local level, then no extensive governmental involvement would be considered necessary.

After reviewing the history of the "scale war" within EJ, it is apparent that social/political actors, mainly activists and researchers, set forth their own analyses of what causes an EJ problem and what the solution might be; other groups challenged these interpretations and policy recommendations by offering alternatives.

The fact is that there are many competing or alternative interpretations and definitions of EJ. They vary according to time frame, standpoint, and emphasis on political or economic factors. Therefore, the meaning of EJ has been reinterpreted and then renegotiated over time. In a nutshell, one's scale choice reflects one's world-view; this world-view cannot go unchallenged through the passage of time.

As Williams (1999a:56) has noted, the battles occur not only in the field of extra-institutional arenas, like grassroots activities, but also in institutionalised systems, such as election campaigns and lobbies. Predictably, battles also take place in academia. Under this scale politics, the winners are those who can successfully frame/reframe a social issue according to their own world-views. By pursuing a specific world-view, actors choosing this particular understanding of scale receive or monopolise resources. The losers, on the opposite side, are those who fail to frame/reframe their argument in terms of the appropriate scale. Since these underdogs are unable to contest the dominant value system, they fail to guide specific activities through particular scales. The punishment for losing the battle is that the losers' resources may be severely restricted. As Herod stressed:

> [r]ecognizing that scale is itself socially constructed opens possibilities for political action because it acknowledges that geographic scales are materially constrained by social actors, and that there is a politics to this constitution. The question geographers should therefore ask, perhaps, is not how scale orders social processes but, rather, how social actors create geographic scales through their activities. (Herod 1997: 147)

4.4 The Boundary Problem: Do maps lie?

4.4.1 Where are the LULUs?

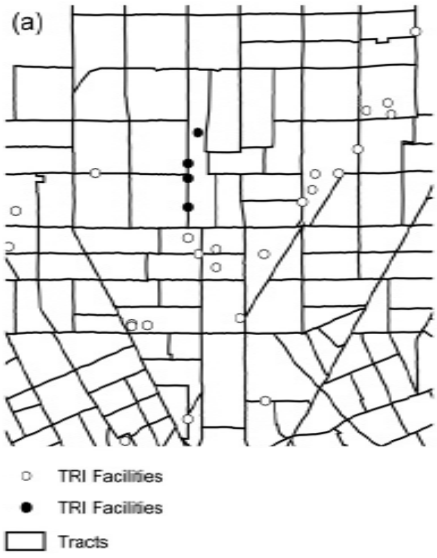
In proximity research, it is common to define an impacted area as the geographic unit, whether it is census tract, zip-code, county, state, or others, where the LULUs are located. In other words, a piece of proximity research does not observe the actual impacted areas directly. Instead, it is the host geographic units which are targeted. However, the strategy of using geographic units to replace the actual affected zones

invites a boundary problem (Fahsbender 1996; Mitchell and Walker 2008).

The boundary problem occurs when LULUs are located very close to the boundary-lines of geographic units, but are assumed to be in the centre of the located unit. In most proximity research, researchers simply compare the characteristics of the units with facilities against those without a facility. This technique presents two fundamental problems. Firstly, it is assumes that the potential impacts affect every part of the host unit equally. As a result, in most cases researchers did not examine the location of the LULUs before conducting their research. They simply treated the centrality of a LULU as given. Secondly, since the actual affected areas are replaced by a given census unit, it is assumed that the impacts stop at the boundaries. From the standpoint of proximity research, only the host unit should be included. Cross-boundary effects are simply treated as non-existent.

In reality a LULU could be found almost anywhere within a unit. When located near a boundary, residents in adjacent units may be affected significantly more than those who live within the host unit. Downey's research (2006) in the Detroit area provided a close-up on the effects of a typical boundary problem.

Figure 4.7: An example of boundary problem



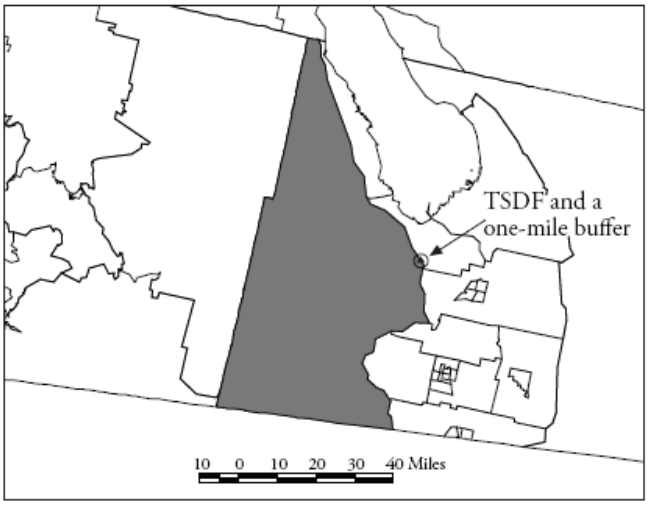
Source: (Downey 2006:578)

Inspecting the above 1990 census tract map, one easily recognises that three of four solid black dots, each representing a facility, are located precisely on boundary-lines. Looking closely, it is also not difficult to see that all four black dots are in fact lying in a single tract. Although all these dots are found within a single tract, these facilities may have different impacts on the host and adjoining tracts. As one can see, the host tract is rectangular in shape. Therefore, the off-centre facility will likely affect adjacent units more heavily than parts of the host unit itself. For instance, it is highly likely that none of these facilities, black dots, will have any impact on the upper end of the tract.

This map demonstrates that the impacts of a facility do not stop at the unit's boundaries. That is to say, although scattered within a single tract, facilities may affect areas other than the host tract. Accordingly, it is problematic to correlate demographics with the location of facilities without first consulting local maps.

It is worth noting that this problem is also a function of the size of the unit (Fahsbender 1996). When the tracts are relatively small, such as those in urban areas, it makes more sense to assume that the impacts are spread equally over the whole tract. In places with small tracts, there will be considerable overlap between these areas and the intersected tracts. Accordingly, the effects of boundary problem are less noticeable in these small tract areas. It is however a very different story in places covered by bigger tracts. If a LULU is sited in the county area where the tract is much larger, then the effects of the boundary problem will be much more obvious. Mohai and Saha's study (Mohai and Saha 2006:386) has shed light on the effects of a large host tract. The figures below demonstrate two large host tracts. In both figures, the facilities were located on the borders between tracts. Because these tracts were so large most parts of the host tracts were clearly unaffected.

Figure 4.8: Some large host tracts in the US



Source: (Mohai and Saha 2006:386)

Source: (Bullard, Mohai et al. 2007:40)

Clearly, the boundary problem may lead to confusion over which environmental burdens will affect which residents. From these cases, we can draw two major conclusions on the effects of the boundary problem. On the one hand, some households may be considered affected simply because they are located within the host unit. In fact, however, the facility may have no impact whatsoever on these households because it is located on the opposite side of a large unit. Other residents, whose households are located in neighbouring units, may find themselves excluded

from an EJ research scheme, despite having the facility in question literally in their "backyards" (Mohai 1995:635; Mitchell and Walker 2008).

Surprisingly, most proximity research neglects cross-boundary effects and treats boundaries as given. In most first- and second-wave studies, the means of defining a community and its boundary went unchallenged. However, it should now be clear that neglect of the boundary problem is dangerous. For one thing, as noted, the boundary of a unit has become an accepted means of demarcating an EJ community in proximity research. To be considered a resident of an EJ community, one's household must be *within* the host tract. Those living outside the host tract, no matter how close their households are to the LULU, are still excluded from the EJ scheme. Also, the boundary problem does not stop at the tract level, since tracts are not the only scale that we can use in proximity research. One can choose political jurisdictions, cities, town, counties, boroughs or zip-codes as the unit of analysis, but each of these choices will potentially run into the same boundary problems. This will be clear after turning to a case focusing on political jurisdictions to further explain the boundary issues.

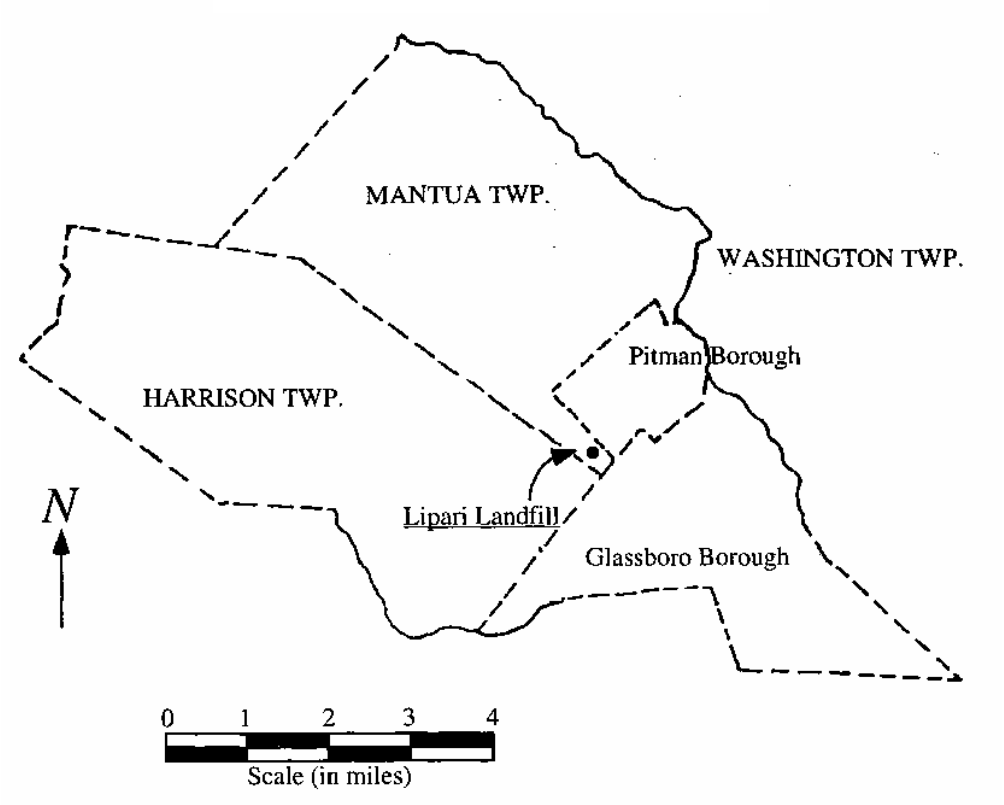
4.4.2 Lipari landfill case: Unit boundary as a means for exclusion/inclusion

Generally speaking, political jurisdictions are too big, as geographic units, to truthfully reflect a LULU's immediate neighbourhood or its affected zones. Thus, when using jurisdictions as the unit of analysis, there is a good chance of committing ecological fallacies. However, despite their larger size, it is not uncommon for researchers or courts apply jurisdictions, as in the GAO case, *Bean*, or *Bibb*, to so demarcate boundaries for EJ arguments.[59] Nonetheless, the boundary problem

[59] This raises a question, if jurisdictions are not proper units of analysis, why choose them? There are three basic reasons why political jurisdictions are used. First, these jurisdictions represent a shared sense of place. Even though this identity is not necessarily a perfect reflection on neighbourhood or community, it still mirrors at least some species of local identify. Next, the demographic data at jurisdiction levels are easy to access. In most cases, all of the information can be found in local authorities or GAO database. Finally, officials in a jurisdiction, such as local EPA officers, are normally the same people who regulate these facilities. Local regulation or the decision making procedural may not apply on other adjoining areas. So, it is important, especially in courts, to

remains at jurisdictional levels. The following case (Zimmerman 1994:648) draws a clearer picture of the boundary problem at the level of a jurisdiction.

Figure 4.9: The location of Lipari Landfill



Source:(Zimmerman 1994:648)

understand the decision-making process (Zimmerman 1994:646-647).

Table 4.8: The demographics in the vicinity of Lipari Landfill

	Pitman Borough	Glassboro Borough	Mantua Township	Harrison Township	Washington Township	Gloucester County
1980 Census	0.4%	16.1%	0.7%	4.8%	2.7%	8.4%
1991 Census	0.5%	18.5%	1.3%	3.1%	3.7%	8.7%

Source:(Adapted from Zimmerman 1994:649)

The Lipari Landfill was a 16-acre site (around 6.4 hectares), including a 6-acre inactive landfill, in Mantua Township, New Jersey. Between 1958 and 1971, this landfill accepted household and industrial wastes. Local residents were exposed to a significant exposure hazard due to their dependence on ground water for drinking (US EPA 1983). Before its closure in 1971, there were at least one explosion and two fires reported at the landfill. The average score for putting an inactive hazardous waste site on the National Priority List is about 40. The score of the Lipari site was more than 70; an extremely high score that saw the landfill listed as the EPA's top Superfund site.

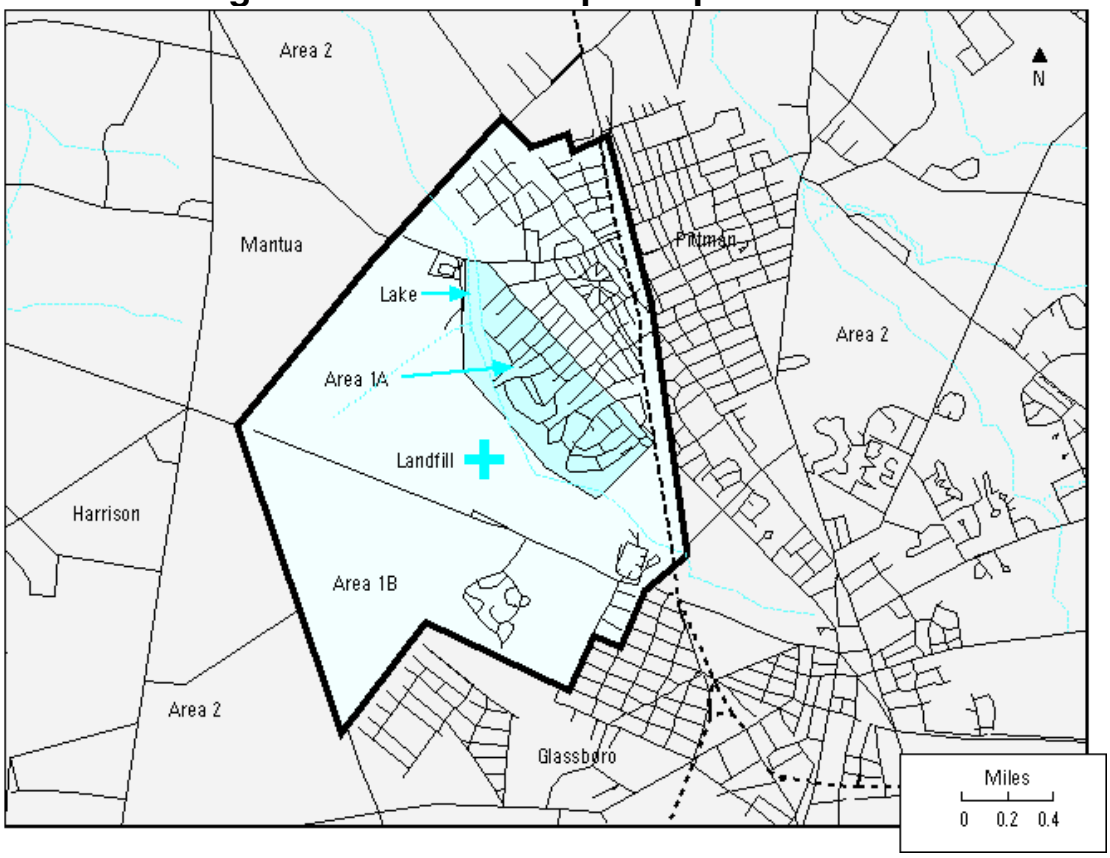
From the township map, above, it is obvious that the boundary problem occurs. This case's boundary problem can be construed from three angles. Firstly, it is particularly difficult to assign one specific jurisdiction to precisely reflect the location of Lipari Landfill. This landfill is located in the corner of Mantua Township, but appears as an enclave directly surrounded by three other jurisdictions, and another jurisdiction, Washington Township, although not adjoining the border, is within several miles of the landfill.

Secondly, no matter to which jurisdiction the landfill site is assigned, the question of whether this assignment changes the characterisation of the community arises. The Black population in Glassboro stood at over sixteen percent; however, that of all other Lapari surrounding areas was under five percent. In Pitman and the host

Mantua area, the Black population plummeted to less than one percent. By the 1990 Census this disparity had become even larger. Compared with a state-wide Black percentage of 13.4, Glassboro's Black proportion had increased to 18.5 percent in the 1990s. If one demarcates an EJ community as the host jurisdiction, Mantua Township, it takes little imagination to predict the results: with such a small Black population, no substantial racial difference (EJ evidence) can be found under this kind of boundary definition.

It seems that this is exactly what happened in proximity research. As we see, Glassboro is within a one-mile radius of the landfill at its closest point.[60] As a result, local authorities must make a decision as to which jurisdictions are immediately affected by the landfill.

Figure 4.10: A close-up of Lipari Landfill



Source: (Berry and Bove 1997:857)

[60] However, at its farthest point, it is as far as four miles away from the landfill.

After conducting a topographic survey, the US Geological Survey confirmed that housing developments in Pitman, not Glassboro, are practically linked to, or affected by, the landfill. So, although more Blacks lived in Glassboro, technically it should not be demarcated into the impacted area (see the figure above). Local residents' perception reflected this viewpoint as well, with locals not aware that Glassboro was being affected; instead, their chief focus was on the nearby lake and tributaries lying in the opposite direction (Zimmerman 1994:650-651; Berry and Bove 1997:857). When demarcating an EJ community, the racial perspective was left out, meaning that Blacks in Glassboro were excluded from the EJ scheme.

Finally, in the course of jurisdiction selection, another distinct question arises concerning which jurisdictional level should be chosen to characterise the impacted area. In the Lipari case, the "surrounding" area was defined at the township or borough level. Yet, one could use a higher upper level, say Gloucester County, as the unit of analysis. Using this approach, the number of Blacks increased from around 1% to more than 8% (Zimmerman 1994:646 ff). Evidently, the choice of jurisdictional levels does make a difference in the characterisation of the socioeconomic setting. Therefore, why we conceptualise political jurisdictions in a certain way is a significant issue in EJ.

As noted in the scale debate (zip-codes v. census-tracts), the existence of "injustice" seems to be dependent on how we measure and define the issue. This is no less true for the demarcation of theoretical and physical boundaries. When our understanding of boundary changes, the ways in which we conceive of EJ follows. By focusing on a particular level, specific people and their social characteristics became "invisible" to research. At the same time, others are over-sampled without this being noted. In order to overcome the boundary problem, it is argued that we must improve the way we measure (Mohai 1995; Mohai and Saha 2006; Bullard, Mohai et al. 2007). Thus, a geometrical way to understand EJ/EJ communities has been introduced.

4.5 The impacts circle/buffer: Toward a solution to the boundary problem?

The boundary problem occurs for two reasons. The first is that a facility can be located anywhere within a unit of analysis. The second is that the chosen units are typically irregular in both size and shape. To counter the boundary problem, researchers attempt to avoid these two sources of error. One common means of doing so is to draw impact circle/buffers (Mohai 1995; Mohai and Saha 2006; Bullard, Mohai et al. 2007).

Figure 4.11: Hazardous waste facility, Host tract and 1, 3, and 5 km circles

Source: (Adapted from Bullard, Mohai et al. 2007:40)

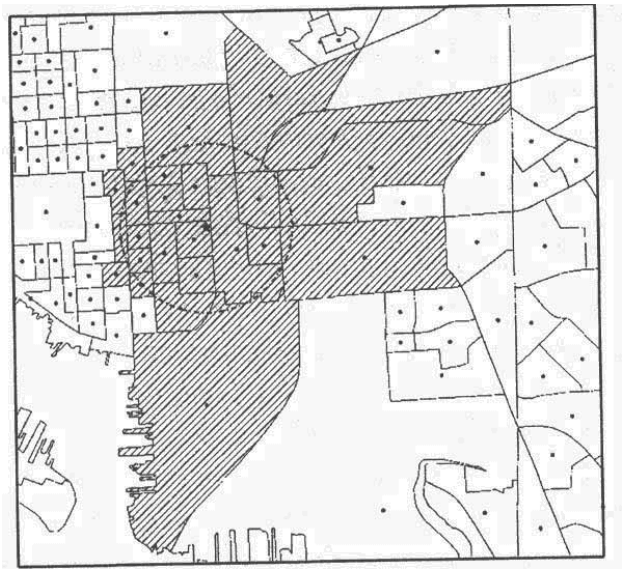
As illustrated in the figure above, to create these circles, researchers draw concentric circles of fixed radii around the observed facilities. By so doing, researchers construct a buffer zone equidistant around the facilities. These buffers, or affected areas, can then be modified easily along with the observed impacts, which might include noise, odours, property values etc. This distanced-based approach has shifted our understanding of EJ.

4.5.1 The distance-based methods

4.5.1.1 Boundary intersection method (polygon intersection method)

The boundary intersection method combines the location mapping technique with the demographic data in predefined geographic units, such as zip codes or census tracts. Researchers draw circles of a specific distance from the LULUs first and then aggregate demographic features of all units captured by the circles (Liu 2001; Forkenbrock and Sheeley 2004; Naphtali 2004; Mitchell and Walker 2008). One distinct trait of this method is that the area of these captured units is considerably larger than the impacts circle. This is because often a unit is only partially intersected by the circle. However, all units, no matter whether they are fully or partially contained by, or only tangential to the circle, are considered within the impact area.

Figure 4.12 : Boundary intersection method (polygon intersection method)



Source: (Liu 2001:170)

To some extent, this method represents an attempt to control the area of an impacts circle because a neighbourhood or an impacts area is confined to the units where at least some portion of them is located within the circle. However, the defined neighbourhood, as we see, covers a substantially large area outside of the impacts circle. When the chosen geographic units are small, the consequences may not be significant because the intersected area can still reflect accurately the impact circle. Therefore, researchers can reasonably assume that residents in these intersected tracts live near the LULUs. However, if the chosen units are large, the research

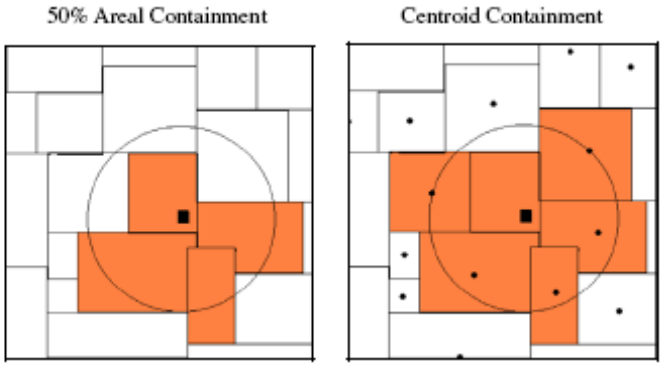
results may be affected noticeably as the populations of some tracts may in fact live far from the LULUs. Thus, similar to the pitfalls confronted by any unit-based approach, this method is less effective in defining proximity for the host neighbourhoods.

4.5.1.2 50% Areal containment and centroid containment method (polygon containment method)

To overcome the disadvantage of the boundary intersection method, other measures are constructed to help decide which units are to be included in, or excluded from, the impacts area or the immediate neighbourhood. Under the umbrella term of polygon containment, there are two ways to achieve the goal of controlling the proximity area. Researchers may either establish a 50% threshold or impose a centroid-covered rule onto the original boundary intersection method (Liu 2001; Forkenbrock and Sheeley 2004; Naphtali 2004; Mitchell and Walker 2008).

The former method refers to the rule that all units with capture areas of less than 50% should be excluded from the research scheme. Otherwise stated, if more than 50% of a unit is covered by the impacts circle, then it should be included in the impacts area/neighbourhood. The latter method follows the rule that so long as the geographic centre of a unit is incorporated in the circle, then the unit is considered as being within the host neighbourhood or impacts area. Concretely, if the centre of a unit is located within the impacts circle, then it should be included in the host neighbourhood (Mitchell and Walker 2008).

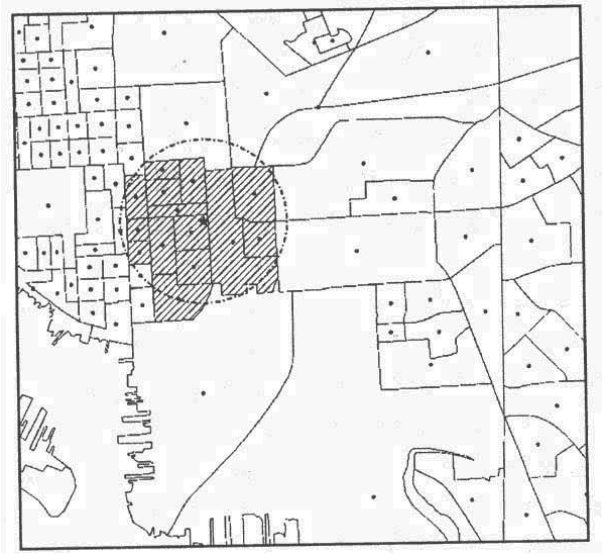
Figure 4.13: 50% areal containment and centroid containment



Source: (Bevc, Marshall et al. 2007:51)

Using these techniques selectively limits the units to be included and makes it more likely that the demarcated area will resemble the original impacts circle. Because this method yields an area that more closely reflect the impacts circle, when researchers compare the demographic data of the captured units against those not captured, the research will prove to be more accurate.

Figure 4.14: Polygon containment method

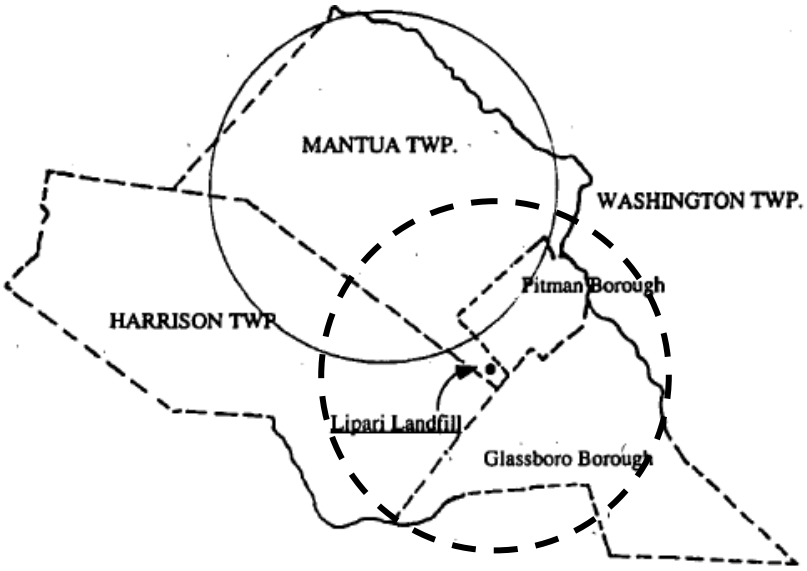


Source: (Liu 2001:170)

It is worth noting that the SADRI research method also yields results in which the impacts circles are centred on the host "tracts" rather than the "facilities" (Anderton, Anderson et al. 1994; Davidson and Anderton 2000). This second wave research is extremely important because SADRI's results contradict others, particularly to those

of the first wave. In SADRI research, circles of a specified distance, 0.5, 1.0, 2.5 and 3.0 miles are used and all tracts within these distances are incorporated into the impacts areas. Using the diagram of Lipari Landfill (Zimmerman 1994:648; see also Mohai 1995:615), we can observe the variations between these two versions of polygon containment method. The dotted circle is the normal impacts circle; the other is the SADRI's version:

Figure 4.15: An SADRI version in polygon containment method



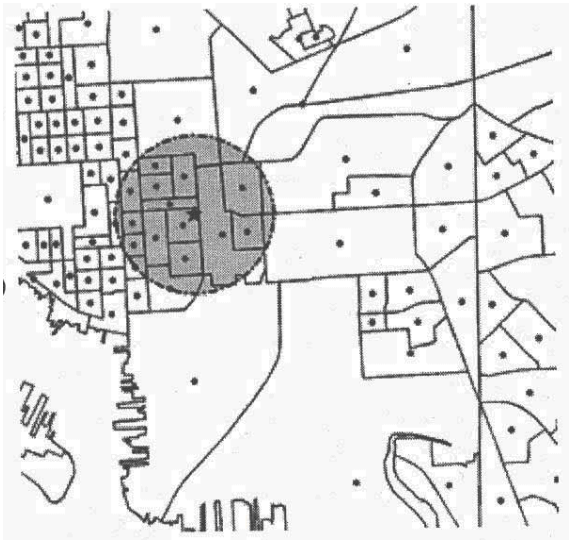
Sources: (Zimmerman 1994:648; see also Mohai 1995:615)

In this mutant version, SADRI takes the centre of the impact circle as the centroid of host tract. This method implies that, instead of investigating the actual location of the landfill, all landfills are sited in the middle of a tract. For this reason, it shares a particular limitation with the unit-based method. When using the SADRI version to demarcate EJ neighbourhoods, the Lipari landfill, as one can see, is not even captured by the impact circle. Moreover, as indicated above, the Black population is highly concentrated in Glassboro Borough, and thereby completely excluded from SADRI's research. Failing to notice this limitation, there is a danger that some target areas will be excluded.

4.5.1.3 Areal apportionment Method (areal interpolation method)

Both boundary intersection and polygon containment methods use geographic units to approximate the impacts circle. As a result, the resulting area formed around the LULUs only comes "close" to being a circle, but will never be perfectly circular. The areal apportionment method, on the contrary, could construct a perfectly circular zone centring at the LULU (Liu 2001; Forkenbrock and Sheeley 2004; Naphtali 2004; Bullard, Mohai et al. 2007; 2008; Mitchell and Walker 2008).

Figure 4.16: Areal apportionment Method



Source: (Liu 2001:170)

Since the areal apportionment method demarcates a perfect impact circle, by collecting demographic data within the circle, in theory, it is possible for this method to estimate the "actual" impacts [61] of the circled residents. However, to be economical of time and energy, researchers rarely gather demographic data from their own surveys of residents. Instead, for areal apportionment method, researchers heavily rely on census data. This means that the method is still very much like the

[61] Proximity researchers use the term of actual impacts very loosely. In proximity research, the so-called impacts circle/zone is based on an assumption that a LULU impacts its environment circularly. However, this is not the case. See next chapter for details.

others in accepting the demographic characteristics predefined by the census. The most significant difference is in how census data are aggregated and weighted.

Rather than weighting equally each unit, as performed in the boundary intersection method, this method's weighting varies with the proportion of the area of the unit captured by the circle. The characteristics of the weighted populations are then compared against those beyond the impacts circle. Since all partially intersected units are weighted by the contained proportion of the unit, this method can safeguard the results from the influence of extreme units. Avoidance of over-influenced or under-influenced units has become a crucial advantage of this method.

4.5.2 Thinking in circles

4.5.2.1 The advantages of distance-based approaches

There are several advantages to using impact circles to define affected areas (Glickman and Hersh 1995; Mohai 1995; Williams 1999b). The first is that these circled areas share similar shapes and sizes. This is especially the case in the areal apportionment method. Now, researchers have no need to simply accept a cluster of pre-defined census units that they are often either too big or too small to express the demographic group being affected. After reconstructing analytical units into circles, researchers can aggregate units to match the size of impacted areas. With a standard size and shape, proponents of this method are convinced that these newly constructed units/circles allow researchers to compare among places scattered over the landscape. By adopting these approaches, the issue of which units to chose can be easily avoided.

A related but distinct advantage is that the location of LULUs can be standardised in the centre of the impact circles. Since the centre of each circle is always a facility, researchers no longer have to refer to a map to assure themselves of the location of each LULU. After this procedure of re-demarcation, one can be sure that every facility is always located at the centre, and that every encircled area is of an identical size and shape. With these geographical units/circles, the vexatious boundary

problem ceases to be an issue.

The last advantage – which is also the most controversial – has to do with the calculation of risks. Advocates of the distance-based research argue that in comparison with the unit-based approaches, this approach could better reflect the full impacts of a toxic site, radially speaking. Although this method still requires a calculation of area of the census data, it is considered more accurate, especially in comparison with unit-based methods. Arguably, it is more convincing to assume that facilities impact equally all equidistant areas; thereby a linear exposure test can be conducted to probe the adverse effects experienced by the residents under study (Williams 1999b; Naphtali, Restrepo et al. 2007). As a result, Mohai (1995) further suggests that the technique of impact circles can be applied in both proximity research and risk-assessment ones.

To a certain extent, the approach of impacts circles introduces a means to avoid errors stemming from the problem boundary and selection among analytical units. However, it does not take long to notice that researchers must now turn to considerations of how large the impact circle should be drawn.

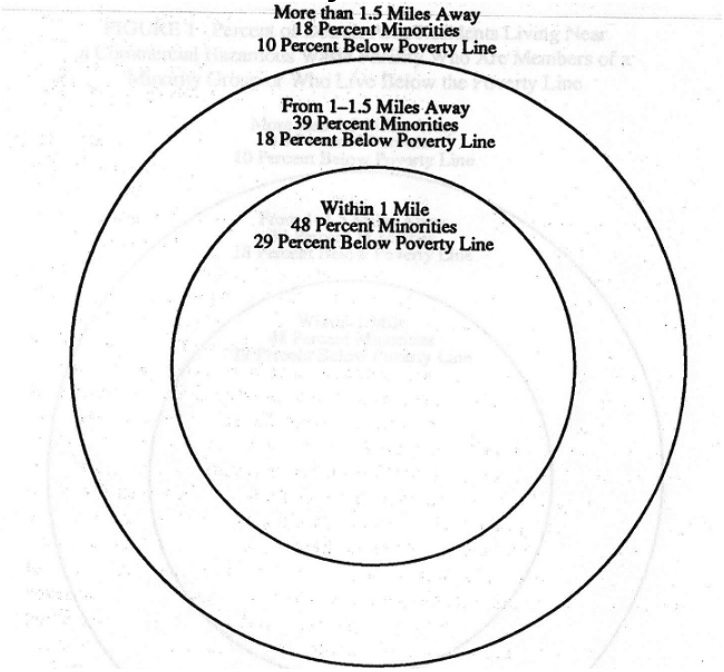
4.5.2.2 The radius problem: No easy choice

In an idea world, the radius of a buffer zone should be associated with the actual impacts from a facility. That is, the radius will vary according to the type of LULU and the risks generated from that LULU. For instance, an incinerator should have a different buffer distance from that of a landfill, because the impacts will be considerably dissimilar. In practice, however, researchers usually use only one, or a very few given distances to construct the buffers as the actual impacts are normally unknown or too complicated to identify. Therefore, to use a given distance to construct a buffer zone is rather arbitrary in itself.

As happened in the debate over "which units to choose" between first- and second-waves, choosing the most appropriate buffer distance is no easy task either. As a

result, the selection of distances seems to be rather inconsistent. For instance, Mohai and Bryant (1992) conducted a countywide survey in Detroit. This research adopted the impacts circle approach and drew concentric circles of 1 and 1.5 miles in radius around the facilities. These circles demarcated three buffers among them. In the first buffer, where residents lived more 1.5 miles from a facility, the minority population was only 18 percent. However, the percentage of minorities rose to 39 percent when focusing on the buffer area between the distance of 1 and 1.5 miles. Within a one mile radius of the facility, the minority proportion increased to an astoundingly 48 percent. Since the minority percentage for the state was only 16 percent, Mohai and Bryant concluded that the higher percentages indicate an obvious racial bias.

Figure 4.17: Mohai and Bryant's research in Detroit area



Source: (Mohai and Bryant 1992:171)

From this research, it seems straightforward to conclude that a racial bias does exist. That immediate conclusion may be misleading. Suppose that, for some reason, racial difference does exist, then it should not be unusual to observe that the further the distance, the less obvious the difference in racial composition. This is because, with the distance rising, the percentage of Blacks/Whites more closely approximates that of the comparison group. In this specific case, the racial difference fades very

quickly. Beyond 1.5 miles no significant difference can be discerned because the proportion of minorities living outside the 1.5 miles' buffer zones is very close to that of the State total population (18% vs. 16%). This raises another question, why chose a one and one-half miles' limit? As one might expect, if the circle were drawn at two miles, the story would have been very different, since a two miles buffer would incorporate a large area where the minority population would drop to a level very close to that of the state-wide average. It is fair to say that the choice of distances/radii matters.

The one and one-half miles radus is not the standard in research of this kind. Radii of half, one-half, one, two, two-and-half and three miles are also used (Anderton, Anderson et al. 1994; Glickman, Golding et al. 1995; Glickman and Hersh 1995; Boer, Pastor et al. 1997; Chakraborty and Armstrong 1997; Hamilton and Viscusi 1999; Sheppard, Leitner et al. 1999; Davidson and Anderton 2000). In the ground-breaking GAO case, a radius of four miles was used. Unfortunately, researchers do not always explain, let alone justify, their choice of distances. In most cases, the chosen distances are frequently treated as given without explanation. It seems that the old question of "how far is far enough, and how far is too far" still haunts this approach. The radii (selection) problem, as Clarke and Gerlak (1998) correctly noted, could be called the "Goldilocks Syndrome" as both researchers and activists make enormous sustained efforts to find the "just right" radii.

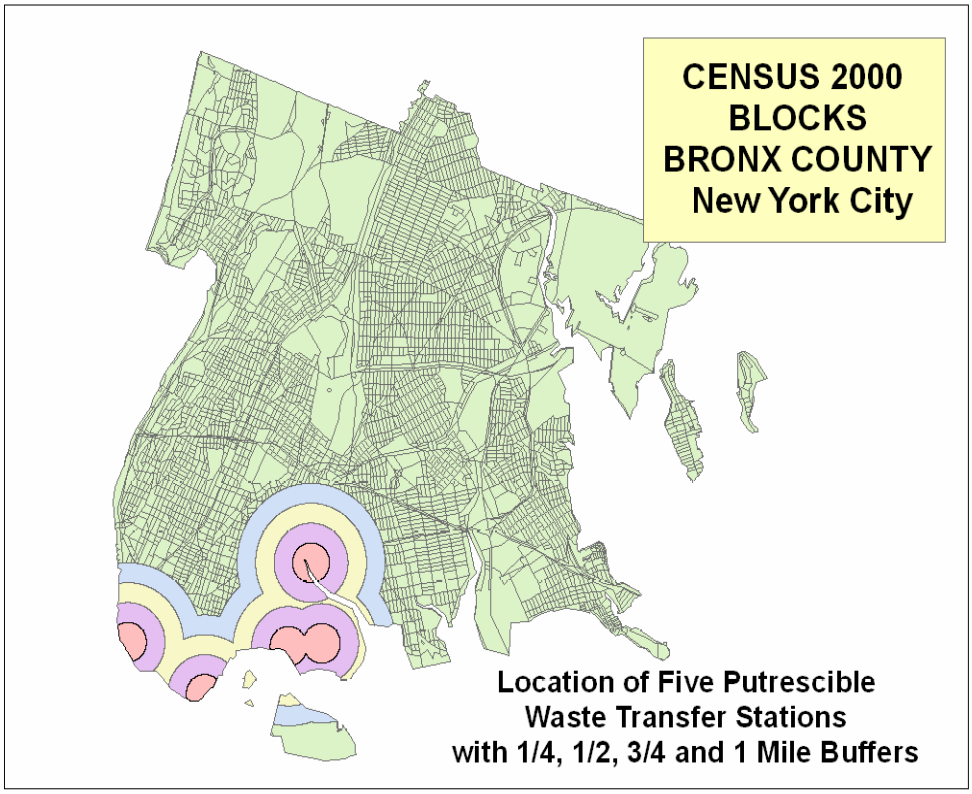
Mohai's pioneering research on the distance-based approach is a good example of the "radius problem" as it illustrates the inconsistency on radii selection. In the above-mentioned Detroit study, Mohai and Bryant (1992) said nothing about why one and one-half miles were chosen to construct the impacts circles. Fourteen years later (Mohai and Saha 2006), bigger buffers have suddenly become more preferable. This time one-, two- and three-mile circular impacts zones are constructed. The reason for selecting these distances yet remains unknown. The inconsistencies did not end there. After 2007 (Bullard, Mohai et al. 2007; Bullard, Mohai et al. 2008), metric measures were introduced, with new impacts circles drawn at distances of one, three and five kilometres (roughly 0.6, 1.8, and 3.1 miles, respectively). The choice

of distances seems arbitrary.

4.5.2.3 The Goldilocks Syndrome: Finding the "best" radius for constructing EJ

For those who attempt to explain their radii selections, the explanations supplied still seem inadequate. Naphtali's research (2004; see also Naphtali, Restrepo et al. 2007) illustrates the Goldilocks Syndrome. In this research, she considered other possible radii, however, a decision was made to use radii of ¼, ½, ¾, and one mile. The author then concluded that populations living within a mile of the locations of waste transfer stations tended to be more Black and Hispanic than that of the Bronx, and that poverty rates are higher within this one mile radius.

Figure 4.18: 2000 Census Blocks, Bronx County, and Waste Transfer Stations



Buffer Radius	Percent Black	Percent Hispanic
0.25 Miles	50.7%	40.2%
0.50 Miles	39.1%	59.1%
0.75 Miles	38.9%	60.1%
1.00 Miles	42.8%	56.4%

Comparison Areas	Percent Black	Percent Hispanic
Bronx	35.6%	48.4%
New York City	26.6%	27.0%
Study Area	39.0%	60.2%

Source: (Restrepo and Zimmerman 2004:271;290)

As we can see, the chosen radii are much smaller than those of other researches, probably because the research area, New York City, is heavily populated. According to the author, her radii decision was made after testing a number of distances. The 1/8 mile distance was abandoned because it covers a large number of "unpopulated" areas zoned for commercial and industrial use. Therefore, the author argued that

using a 1/8 mile buffer did not “make any sense”. Likewise, it makes no sense, she argues, to include a radius greater than one mile because at a distance of more than one mile the percentages of minorities begin to approach the level of comparison areas: the South Bronx, the whole Bronx, New York City, etc.

From this case, it does not take much imagination to see that the selection of radii matters. Her study reveals that the highest percentage of Blacks lives in the immediate vicinity – within a quarter mile of the site. Yet, moving further from the LULU, the percentage of Black residents quickly drops to the level of comparison areas. Specifically, beyond 0.5 mile circle the Black percentage approaches the level of the study area and the Bronx as a whole. Intriguingly, the pattern for the percentage of Hispanic residents is reversed. The percentage of Hispanic residents within the 0.25 mile circle is similar to that in the Bronx, but considerably lower than that of the study area. However, the percentage of Hispanic in the other three circle areas is very similar to that of the study area but higher than the Bronx as a whole.

So, does environmental “injustice” exist in South Bronx? The answer largely depends on who (which minority population) and which circles are under discussion. There seems to be an unequal (injustice) pattern towards Blacks within a radius of 0.5 mile. However, for Hispanics there seems to be “too much” justice, especially within the 0.25 circle.

Several points are worth noticing here. First, even though the research target is a densely populated city, like New York, it is still possible to find “unpopulated” areas. In this case, at the census blocks level the percentage of unpopulated blocks is 34.8% for the study area, compared with 24.3% in the Bronx as a whole. Similar phenomena can be found at the block group level. At this larger level the unpopulated rate considerably dropped to 4.3%, and that of the Bronx in general decreased even further to 1.8%. The problem is that these areas are not unpopulated for no reason. To some extent, these unpopulated areas reflect the nature of rurality or of industrial location. If that is the case, then differences among buffers may simply be a product of the characteristics of different zonings, not of injustice or

racism.

As the author explained, 1/8 mile buffers should be excluded because they cover a large number of unpopulated areas. She further explained that these areas are unpopulated because they are zoned for industrial or commercial use. That is to say, the LULUs are located in industrial or commercial areas (Naphtali 2004:270). As second wave researchers have repetitively argued, the comparison between rural and urban areas should not be used to conclude that "injustice" exists. For similar reasons, to compare an industrial area with the residential is also less meaningful because results of this kind reveal nothing but the difference between industrial locations and the comparison area (Anderson, Anderton et al. 1994:92; Mitchell and Walker 2008; Bowen, Atlas et al. Online First).

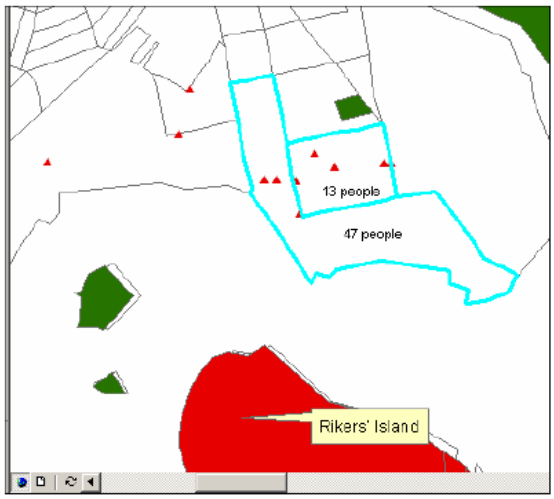
The second issue concerns individual fallacies. Suppose that the result at 1/8 mile, as the author argued, is less meaningful such that the 1/8 mile radius should be ruled out. This reason alone does not, in any way, elucidate why the chosen distances are better than those which have not been chosen, say 1/3 or 2/3 mile. This is a typical individual fallacy, wherein an individual case is falsely generalised to explain other cases. Just because 1/8 mile, or a distance of more than one mile, is inappropriate to be used in a particular piece of research does not mean that other distances in the range between zero to one mile are unsuitable as well. Researchers seem to take these radii as given.

Individual fallacies can also be recognised in her decisions on who/where to exclude, or include, from the research scheme. Small buffers of 1/8 mile are excluded from her research on the grounds that these buffers contain large unpopulated areas. By definition, EJ concentrates on the composition of population rather than the total population, or population density. As a result, if an area is completely unpopulated, then it is reasonable to exclude these unpopulated tracts, since the exclusion makes no difference to the make-up of the population.

In this case, however, some areas do contain some at the census block group level.

Therefore, it seems unjustifiable to exclude an area on the basis of a sparse population alone since population density itself is not a target of EJ research/studies. For similar reasons, it is also indefensible to argue that the 1/8 mile buffer should be excluded, especially so when most LULUs are highly concentrated in these areas. Therefore, it seems strange to simply "abandon" these people without any further investigation.

Figure 4.19: Some so-called unpopulated areas



Source: (Naphtali 2004:282)[62]

Here, it is evident that these circles/buffers are used as a means to decide who is to be included and who to be excluded. The demarcated buffers are constructed in such a way that they can correctly reflect the "Blackness" or "injustice" of an area. If the chosen buffers are too big, then the unequal distribution becomes too vague to demonstrate the inequity. On the contrary, if the buffers are too small, then the research easily comes under attack for the accusation that it simply reflects zoning features. Although most researchers claim that their research closely reflects the distribution of environmental risks, in reality it seems that researchers are making an attempt to "construct" the injustice/EJ.

[62] As we can see, although there were 60 (13+47) people in these areas, these tracts were treated as "unpopulated" on the basis that information about these people is unavailable from the Census data.

4.5.3 Radii politics: Complicating the problem of environmental injustice

Some may argue that, methodologically speaking, multiple radii research gives us an insight into the problems of EJ (Mohai 1995; Rhodes 2002; 2005; Bullard, Mohai et al. 2008). No matter which units are chosen, a traditional unit-based approach can only provide us with a static result, i.e. justice or not. In a multiple radii research, EJ is treated as a dynamic continuum rather than a static result on "injustice/justice". That is, the gravity of injustice in a distance-based research fluctuates with the changing distances. Therefore, unlike a unit-based approach which generates a straightforward answer on the existence of injustice, one cannot simply arrive at a single conclusion on EJ from a distanced-based research. In this vein, using multiple radii reveals the very dynamic nature of "justice".

Theoretically, it may be true that findings in a multiple radii research are more fruitful than those of unit-based research. However, we should be sensitive to the consequences of flexibility in choosing radii because this may cause further problems. Having learnt from the fierce debate on "scale politics/war", different analytical techniques/units may cause different findings. Since one can easily generate different results by changing the analytical units from zip codes to census tracts, this gave second- and third-wave advocates a chance to argue that since the gravity of environmental injustice is a *known unknown*, extensive governmental involvement would not be necessary. In the debates on scale politics, these theoretical controversies rapidly turned into a debate in the public sphere.

This is no less true in a distance-based camp. Since the radii selection is crucial in determining the existence of "inequity/injustice", the debate on which radius to use appears unavoidable. Nonetheless, considering the various goals of EJ researchers, as we can imagine, it is extremely difficult for researchers to reach a consensus on which radius/radii is most appropriate in defining the impacts areas. In the above-mentioned Mohai case, a consensus cannot even be found in the research conducted by a single researcher. In the foreseeable future, the selection of analytical radii may fuel the debates on "radii politics".

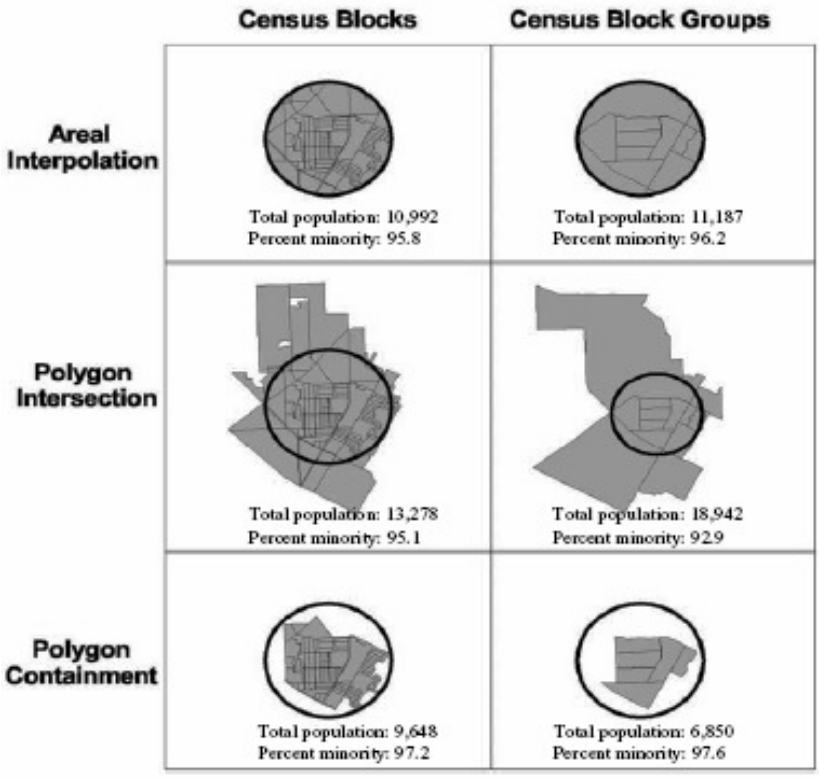
The debates of radii politics seem more complicated than those of scale politics. In scale politics, incompatible findings usually exist among camps. For instance, results generated from second wave research draw conclusions opposite of those arising from first wave research. Under distance-based approaches, incompatible findings exist not only "among" studies but also "within" each study, since injustice/inequity is considered a continuous process. Conflicting conclusions will almost certainly occur in every single distance-based study. These contrary results drawn from disparate radii seem even harder to tackle. As noted in the Naphtali case, whether injustice exists or not is largely dependent on the radius/radii to which one refers. Injustice/inequity is observed increasing or decreasing among radii. The existence of inequity has become even more arbitrary than that of scale politics. The artificial nature of analytical radii raises as many questions as it answers.

There is one thing that has not been tackled, the existence of at least three ways to conduct distance-based research. Having three approaches from which to choose, the question arises of how to choose the most appropriate. Now, we turn to sensitivity analysis among the available approaches.

4.5.3.1 Sensitivity analysis: Should there be only one approach in defining EJ?

In sequential research, Naphtali, Restrepo et al. (2007) conducted sensitivity analysis to understand the effects of different distance-based methods. Significant differences were found among the methods. The figure below shows the relationship between Census reporting units and three common distance-based methods.

Figure 4.20: Census reporting units and study area geography



Source: (Restrepo and Zimmerman 2004:266)[63]

In this research, a combination of blocks and block groups was investigated. While blocks are the most accurate, and also the smallest census data available, for reasons of privacy protection, only limited demographic information is reported at this level. For instance, data on poverty, income and housing values are unavailable at the block level. Thus, it is best, the authors suggest, to use another form of small-area census data – block groups – to consolidate its findings. However, when introducing another set of data, the total population differs from approach to approach. When the included samples are changed, different findings follow. At times, the difference can be as much as 12,092 people, or 4.7% (Forkenbrock and Sheeley 2004:30). The Figure below has demonstrated the effects of approach selection.

[63] This figure shows how research targets/areas are affected by choosing different methods and Census data/units. Note that the same one-mile buffer is shown in each diagram; however, combining different method and Census data, the captured areas and populations vary. When the target areas/populations vary, the research results follow. Additionally, it may be confusing why different methods in areal interpolation capture slightly different total population. That is because the intersected population is proportional to the captured units (in this case blocks or block groups).

Table 4.9: The effects of approach selection[64]

Buffer Radius	POLYGON INTERSECTION	AREAL INTERPOLATION	POLYGON CONTAINMENT
		TOTAL POPULATION	
0.25 Mile	13022	5429	1252
0.50 Mile	70187	51859	35149
0.75 Mile	129378	109941	95179
1.00 Mile	199721	184968	160081

	POLYGON INTERSECTION		AREAL INTERPOLATION		POLYGON CONTAINMENT	
Buffer			PERCENT			
Radius	BLACK	HISPANIC	BLACK	HISPANIC	BLACK	HISPANIC
0.25 Mile	46.2%	53.5%	49.5%	50.7%	61.3%	37.7%
0.50 Mile	35.6%	66.2%	36.4%	65.5%	36.4%	65.0%
0.75 Mile	33.3%	68.4%	33.4%	68.3%	33.0%	68.9%
1.00 Mile	35.7%	66.0%	35.2%	66.6%	34.5%	67.3%

Source: (Naphtali, Restrepo et al. 2007: internet version see www.nyu.edu/its/pubs/connect/spring07/naphtali_gis.html)

As we can see from the above, each approach captures varying census units that overlay a study area. In general, it is argued that when simulating an impacts circle the polygon intersection technique tends to over-predict the population; conversely, the polygon containment method tends to under-predict the population. The areal interpolation method therefore is considered the most accurate of the three, although it is more data intensive than the others. While the same one-mile circle is shown in each diagram, there is a great difference between the shaded/captured census units. Within the captured areas, the captured population and its percentage of minorities varies from method to method and unit to unit.

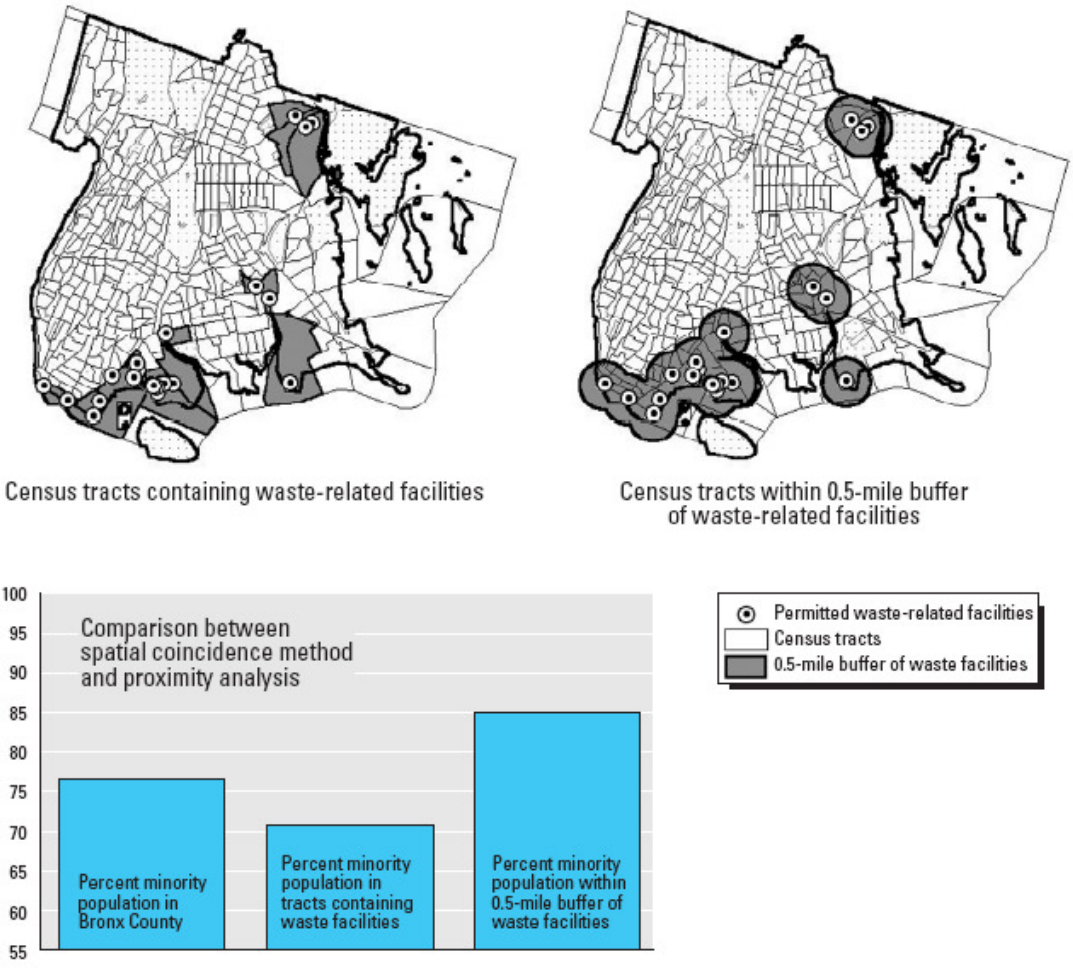
The effects of zone definition may also be discerned between distance and unit-based approaches, as Maantay (2002) illustrates by focusing on LULUs in the Bronx. From this case, we can see how inequities arise in the assessment of EJ. The minority

[64] This figure shows how the research results are affected by the choice of methods and radii. The upper half of the figure shows that, in a given radius different approach choices change the captured population. For instance, combining the 0.25-mile buffer with polygon intersection, this approach captures as many as 13022 people; in contrast, polygon containment in the same 0.25-mile buffer captures only 1252 people. The other half of the figure shows how the percentages of minorities are changing with different approaches. As one can see, within a given radius different methods have various Black percentages. Similarly, Black percentages are changing among radii/distances as well.

population in Bronx as a whole was 76%. Consequently, when choosing the unit-based approach where minority population stood at 71%, no inequity could be identified. However, shifting the focus to the 0.5 mile buffer, the minority population increased to 87%.

Again, it is evident that the way we measure EJ will affect our findings. One can easily come to opposite conclusions regarding the gravity of EJ in the Bronx. According to its advocates, in general, the distance-based approach is more reliable and accurate than that of the unit-based. If that is the case, it lends support to the conclusion that injustice/inequity existed in the Bronx. It raises the question: Are these approaches as different as their advocates claim?

Figure 4.21: Comparison of two approaches for LULUs in the Bronx, NY

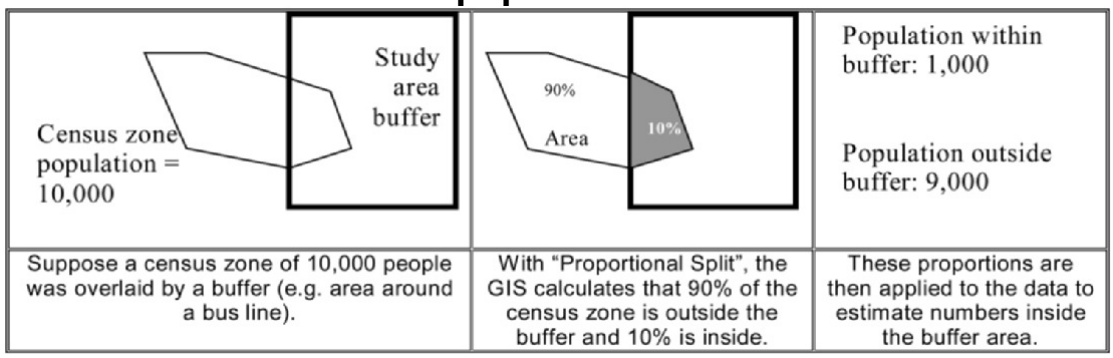


Source: (Maantay 2002:165)

4.5.3.2 Is the impacts circle our best choice? Not as different as we thought

There are curious parallels between the distance-base and the unit-based methods. The distance-based approach, as noted, is still highly dependent on census data, meaning that distance-based techniques are not as novel as their advocates assert. This is particularly true in cases employing boundary intersection and polygon containment methods. To observe closely, the impacts circles in these two methods are treated as an inclusion or exclusion threshold to decide whether to count a particular unit as within the target area. In other words, both boundary intersection and polygon containment methods are still unit-based. The only difference is that the traditional unit-based research counts only the host unit where the LULU is located; the distance-based instead aggregates "several" units in proximity to the LULU. Strictly speaking, these two methods are simply a mutation of the unit-based approach.

Figure 4.22: The way areal interpolation weighs intersected population



Source: (Schlossberg 2003:214)

In the case of areal interpolation, it is believed that this method gives a better approximation of the impacts circles among these three distance-based methods. Indeed, this method still faces limitations similar to some of those faced in the unit-based approach. This is because the way areal interpolation weighs its population implies that when an impacts circle intersects a unit, the captured population is

proportional to the captured area (see the figure above). Its reasoning is that when residents are scattered equally within a unit, their characteristics will be distributed uniformly as well. Indubitably, this assumption can only exist when the population of a unit is distributed equally. In reality, equal distribution of a population rarely happens, as we have seen. In this respect, the drawback of uniformity, which is common in any unit-based research, continues to be a problem in this so-called "improved" approach. If these fundamental problems remain unsolved (Mohai and Saha 2006:388), more questions are certain to arise.

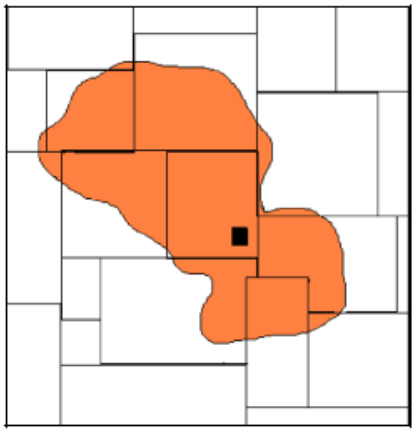
When it comes to areal interpolation, most researchers seem to imply that in situations where detailed demographic data is available, areal interpolation is the best to use. If areal interpolation is best to measure EJ, then special attention should be brought to the politics of scales/radii behind this argument.

4.5.3.3 Mathematical understanding of EJ: Is areal interpolation the best way to understand EJ?

It is true that areal interpolation may best simulate an impacts circle so that populations within the circle can be more accurately estimated. Yet, it is misleading to suggest that when accuracy in simulating impacts circle arises the measurement of EJ itself is certain to improve as well.

For one thing, there is a danger that one might well confuse the impacts circles with the actual impacted areas. When it comes to the distance-based approach, its supporters have conveyed an impression that these impacts circles are, or at least very close to, the actual impacted area in itself. Research, therefore, should reflect these circles as accurately as possible. In effect, however, these so-called "impacts" circles reflect only the assumed/perceived impacts areas, rather than the actual impacted areas. Therefore, these circled areas remain a poor surrogate for the actual exposures or impacts areas.

Figure 4.23: An example of the actual impacted area

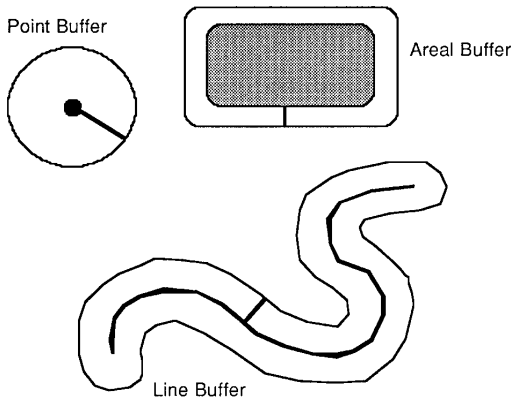


Source: (Bevc, Marshall et al. 2007:52)[65]

As one might imagine, in most cases a pollutant contaminates its adjacent environment through one or multiple media. In addition, different pollutants have various effects on the adjoining environment. As a result, their environmental effects are rarely circular, but rather irregular. Likewise, it is inadequate to use a "point" to represent the location of a LULU. In some cases, e.g. a big landfill, a spatial area is far more suitable to represent a facility (Mitchell and Walker 2008). To reflect the nature of irregularity and the shape of a LULU, researchers should introduce multi-shaped buffers in accordance with the pollutants and the shapes of LULUS. The problem is, with the introduction of multiple buffers then the major advantage of a distance-based approach, i.e. standard shape among areas, disappears. Besides, these multiple buffers can be further combined with different aggregation methods.

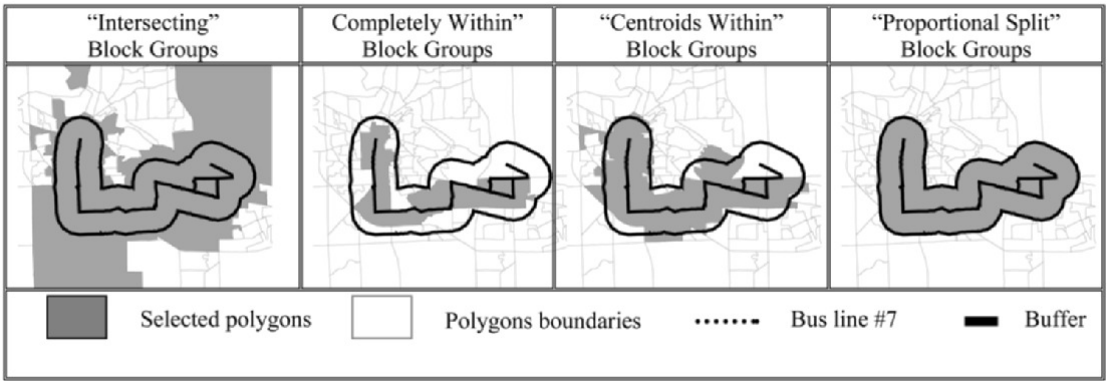
[65] As we can see, the actual impacted area is not a circle.

Figure 4.24: Multi-shaped buffers



Source: (Sheppard, Leitner et al. 1999:22)[66]

Figure 4.25: ine buffer technique combines with different buffers



Source: (Schlossberg 2003:214)[67]

For another, areal interpolation is highly mathematical. Thus, it explicitly demonstrates the artificial nature of the impacts circles for which boundaries are defined. As noted, this method reflects no community/neighbourhood boundaries whatsoever. That means also that some underlying social or geographic processes are missing because of the way the borders of these circles are demarcated.

In effect, census units and their boundaries were not constructed without reason.

[66] As we can see, the method of impacts circles is not the only way that one can draw his/her buffer.
[67] Combining the line-buffer technique with different aggregation methods, we find that different areas are captured in each combination.

These census boundaries are usually delimited to reflect local history and their social/demographic attributes (cf. Williams 1999b). In a sense, to keep these census boundaries intact is to keep these communities "visible" in one's research scheme. Arguably, among these three distance-based approaches, the others better reflect these community boundaries than does areal interpolation. Under boundary intersection and polygon containment, at least the census-predefined boundaries remain intact. It is not as clearly evident as some claimed that areal interpolation is the best in EJ research.

4.6 Unpromising future: Thinking outside the circles

Ironically, although supporters of the distance-based approach are convinced firmly that these radial zones are capable of bridging gaps in the unit-based approach, their achievements have been extremely limited. Under the distance-based approach, it has become easier to compare radial circles; in a sense this approach makes it possible to overcome the limitations of place-based "militant particularism" (Harvey 1996:370-371; 1999; Kurtz 2003).

EJ used to be seen as another means of discussing NIMBYism (Not-In-My-Back-Yard). For a long time, EJ advocates endeavoured to move away from local/place-based disputes. To transcend NIMBYism, it is emphasised that EJ is concentrated on racial/socio-economic disparities in environmental quality. By so doing, EJ advocates have successfully re-positioned EJ as a general/national issue. After extending their campaign scope to a national level, it is argued that local struggles should be observed from a national perspective. NIMBYism, activists explained, is not the reason why locals protest against a particular LULU; a LULU is locally unwanted in that it is located in an already burdened Black neighbourhood. Applying scale in this way, a local protest is in fact representing a national struggle against racism. As one can see, after re-demarcating community boundaries as circles, the gap between local and general/national issues can be further bridged because the boundaries of locals, like those of communities and neighbourhood, have become very fuzzy. Under these circles, the characteristic of locality disappears. And, EJ is

linked directly to the general movement, i.e. Not-In-Black's-Back-Yard.

Truly, it is important to cross the divide between local actions and a larger social movement. The problem is, EJ is embedded deeply in place and local experience. Attempts to understand EJ mathematically, as distance-based approaches have done, has eliminated not only community boundaries but also the communities themselves. By definition, a community/neighbourhood is where its residents consciously share some social or cultural attributes (Bullard 1994a; Fahsbender 1996; Bullard, Mohai et al. 2007). Residents within the imposed impacts circles simply do not share a local identity.

Bullard[68] (see also1994b; Williams 1999b) has expressed this very concern on the limitations of a method in which the impacted communities/neighbourhoods are not included. The goal of EJ, as Bullard (1987; 1994b) argues, is to reveal discrimination in which communities are targeted because of who they are (their "Blackness"). Nonetheless, under these circles, communities or neighbourhoods are mathematically and scientifically re-defined. According to Bullard, when communities become indiscernible, then the impacted residents are rendered *invisible* in these studies.

Obviously, the distance-based approach has rendered communities invisibility. Within the constructed impacts circles, there are no discernable communities but only residents, or more accurately, people, scatter on the landscape. Without local identities, the only way to mobilise the locals is to claim victimhood for these residents. But it is hard to know whether or not residents living in close proximity, say in a one mile radius, tend to share similarly victim experience; those living outside of these one-mile radii somehow do not consider themselves as having been victimised. To define a community mathematically may cripple EJ's broader political potential.

[68] Intriguingly, it seems that Bullard has abandoned his neighbourhood approach already. Recently, he has embraced the distance-based approach. In his latest studies, distance-based approaches are considered better for analysing EJ (Bullard, Mohai et al. 2007; 2008).

This is no mere rhetorical move or semantic questioning of a theoretical debate on the practical definition of community. With the spatial boundaries being redefined, the re-demarcation of EJ follows. Under the Bush Administration, the EPA attempted to re-define EJ's meanings and its scales. Echoing the second- and third-waves' claim, the Bush EPA sought to remove race and class from their official definition of EJ. In doing so, the EPA switched the focus of EJ. By deemphasising minority and low-income populations, the concept of "environmental justice for everyone" was introduced (Carroll and Weber 2004; Bullard 2005; Sze and London 2008).

The notion of "EJ for everyone" exemplifies a challenge in the politics of scale. Under this definition, EJ is redefined as "equal protection"; thereby the issue of how to identify an EJ community is considered subordinate. In a way, the practice of defining EJ communities in itself is unequal, because the EPA should protect everyone equally and must not give anyone special treatments. At a glance, it appears that the meaning of EJ has been expanded to protect "everyone". Therefore, this definition enlarged its scale to cover more people. In reality, however, it has minimised some particular facets of EJ. For instance, the facet of environmental racism and equity has been diluted, because it is considered "special-protection". Communities with special interests, the so-called EJ communities in previous definition, are excluded from the "EJ for everyone" scheme. Now, the EPA was attempted to pursue "equal" protection. By changing the scale and focus of EJ, the EPA can easily confine its involvement to the EJ issues. Although the scheme for redefining EJ has been abandoned due to severe opposition, it illustrated the threat that politics and values always remain disguised behind the selection of scales (Bullard 2005; The National Black Environmental Justice Network 2005).

As we can see, EJ is in danger of being understood in purely mathematical terms. In a nutshell, using circles to demarcate communities implies that people have to live within a given circle/buffer or they will not be considered as shouldering disproportionate risks. A similar assumption can be discerned in the unit-based research. As noted, this assumption is under attack for its purely artificial means of demarcating the boundaries of risk-effects and communities. Researchers from

second- and third-wave camps might reject a distance-based approach on grounds that these circles reflect only “perceived/assumed” risks, not the actual risks. They enquire, how does the distribution of proximity to health hazards compare with monitored population data (actual risk)? They argued that one should always consult a pollution/exposure map before choosing proximity indicators. Although a risk-based approach seems to reflect the risk more accurately, in fact such an approach brings more questions than answers. Now, I turn to the risk-based approaches.

5 Risk matters: Can EJ be saved by risk analysis?

5.1 Introduction

Debates over contemporary EJ research have spawned two distinct sets of literature, a literature that discusses EJ in a spatial frame, and one that discusses EJ on the basis of the newly budding risk analysis. Somewhat curiously, these two sets of literature have largely developed separately. Recently, these two streams of literature have begun to converge, because critics argue that the tradition of EJ has been driven and dominated by spatial pattern of distribution that have moulded, and sometimes warped, our understanding of EJ. For most people, it is no longer sufficient for a researcher to report the spatial distribution of "risks" without investigating and characterising that risk. For this reason, both sides of the research streams require convergent risk-based EJ research.

Arguably, few scientific challenges are more complicated than estimating and managing the health/environmental risks associated with exposure to a chemical. The reason is straightforward: investigators cannot feed or deliberately expose people to chemicals to see "how exposed is exposed enough". Instead, researchers use animal tests or rely on accidental human exposure in the field to determine a regulatory point. Since such studies are heavily dependent on extrapolated data, the uncertainties are pervasive, but as absolute certainty is impossible, regulators have no choice but to use the best available evidence as they set limits (Montague 1995; Michaels 2005). Once EJ begins to consider risk, a broader question soon emerges: Should the EJ movement and research be risk-driven?

In the field of risk analysis, some seemingly important issues are hotly debated. These debates however are not particularly relevant to the broader issue of EJ. Obviously, the alleged convergent approach has in fact produced more questions than answers. In this chapter, I first discuss how risk has become an issue in EJ research. I

then look into how the selection of dataset affects one's findings and go on to speculate on the potential role of risk assessment in EJ. Finally, I suggest how the term of risk in itself has shaped our understanding of EJ.

5.2 The risky business of risk assessment: Is risk assessment the answer?

5.2.1 The risk floodgate has been opened accidentally

After SADRI published its research and challenged the consensus that emerged from first wave research, a debate arose over the necessity of further distinguishing between sources of risks. Plainly, since varying sources of pollution impose dissimilar risks on local residents, it seems insufficient to assign all types of LULUs to a single, standardised category and then calculate their spatial distribution accordingly. For instance, in EJ research, landfills and incinerators are singled out as sources of injustice. However, the effects of a landfill must be very different from those of an incinerator, given that the diffuse pattern of pollution from an incinerator shares few similarities with that from a landfill. For this reason, some, such as Bullard (1994d), insist that it is a mistake to impose a standardised model on these two disparate sources. They argue that conscientious research should always distinguish between a landfill and an incinerator, if for no other reason than to ensure that one can assess whether or not Blacks/poor communities truly bear greater risks.

Bullard has done just that (Bullard 1994d). In a debate with SADRI, Bullard criticised SADRI's research on the grounds that SADRI did not distinguish between different types of TSDFs. That is, SADRI treated all pollution sources as essentially similar. In so doing, SADRI implicitly assumed that all sources of pollution impose similar burdens on the local environment. In order to fully understand unequal patterns of risk distribution, researchers must identify the various sources of risks, Bullard stressed. To a large degree, Bullard did exactly what he asserted above. Even in his earliest research in Houston area, risk sources – mainly landfills and incinerators – were carefully distinguished:

All five of the large garbage incinerators were located in minority neighbourhoods – four black and one Hispanic. All five of the city-owned landfills were found in black neighbourhoods. Although black neighbourhoods composed just over one-fourth of the city's population, more than three-fourths of Houston's solid-waste facilities were found in these neighbourhoods. Moreover, lower-income areas, or "pockets of poverty," have a large share – twelve out of thirteen –of the city-owned garbage dumps and incinerators. (Bullard 1990:42)

From the early 1920s through 1978, more than 80 percent of Houston's household garbage landfills and incinerators were located in mostly Black neighborhoods - even though Blacks made up only 25 percent of the city's population.(Bullard, Mohai et al. 2007)

Table 5.1: Some excerpts from Bullard's research

City/State	Community Size[a]	Facility Owner	Nature of Problem
Northwood Manor (Houston, TX)	8,449	Browning Ferris Industries	Municipal landfill
West Dallas (Dallas, TX)	13,162	RSR Corp.	Lead pollution
Institute (West Virginia)	1,450	Union Carbide	Chemical emission
Alsen (Louisiana)	1,104	Rollins Environmental Services	Hazardous waste
Emelle (Alabama)	626	Chemical Waste Management	Hazardous waste

[a]Community size refers to 1980 census areas--census tracts and enumeration districts--that are used by the census for data gathering.

Source: (Bullard 1990:41)

Neighborhood	Location	Incinerator	Landfill	Target Area[a]	Ethnicity of Neighborhood[b]
Fourth Ward	Southwest	1	1	Yes	Black
Cottage Grove	Northwest	1	-	Yes	Black
Kashmere Gardens	Northeast	2	-	Yes	Black
Sunnyside	Southeast	1	2	Yes	Black
Navigation	Southeast	1	-	Yes	Hispanic
Larchmont	Southwest	1	-	No	White
Carverdale	Northwest	1	-	Yes	Black
Trinity Gardens	Northeast	-	1	Yes	Black
Acres Homes	Northwest	-	1	Yes	Black

[a]Target areas are designated neighborhoods under Houston's Community Development Black Grant (CDBG) program.
[b]Ethnicity of neighborhood represents the racial/ethnic group that constitutes a numerical majority in the census tracts that make up the neighborhood.

Source: (Bullard 1990:43)

Incidentally, Bullard's decision to distinguish between different sources of risk opened the floodgates. Once researchers start to demarcate among different risk sources, the question of where to stop arises. No clear consensus on the appropriate selection of risks has emerged, in part because each targeted risk addresses different types of questions. First wave scholars normally divide LULUs into two large groups: landfills and incinerators. Allies from other camps, however, disagree with this distinction. It is argued that attention has been concentrated on landfills and incinerators because the waste they manage is closer to everyday life, not because there is anything inherently or extraordinarily hazardous about their equipment or processes. As Been contends, other built-environments such as prisons and shelters are equally, if not more, risky than a well-managed landfill. If that is the case, why focus on "environmental" justice? Why not focus on food justice or prison justice? (cf. Noonan 2005; Alkon and Norgaard 2009)

The above debate soon intensified. A clarified boundary is demanded by the third wave allies who insist that a subdivision of LULUs is always needed unless we can single out exactly which risk minorities are disproportionately shouldering (Foreman Jr 2000; Davidson 2003). For this camp, LULUs vary according to their management, size, and the amount of hazardous waste they are managing. They further argue that if the first wave is truly concerned about risks, all of the above-mentioned issues should be taken into account. Accordingly, critics have argued for the need to conduct case-by-case analyses for each site. By so doing it is believed that researchers can avoid skewed assumptions which treat each site as if each posed an equal, or similar, risk to the host community. The debate between different camps began to trigger a shift in thinking regarding risk and risk assessment.

5.2.2 Semantic attacks: Risk analysis as a political leverage

Some commentators (Cross 1992; 1995; Shere 1995) stress that current risk assessments, as well as EJ assessments, involve a one-dimensional practice in that they fail to consider the possible *negative* effects of the

regulations/assessments themselves. Adherents of this perspective suggest that environmental regulations, such as compulsory EJ assessments, may in fact impair, and perhaps even kill, the target population that they should be protecting. The argument is straightforward: Given that budgets are limited, the more you spend on EJ (or risk assessment), the less you can devote to other uses, like extra medical exams or basic nutrition. The latter however may do more to improve the health of minorities. Economic studies (Shere 1995:472; Graham 1995a; Viscusi and Gayer 2002) have concluded that every 3 million to 7 million dollars spent satisfying regulatory costs may result in one additional premature death. Put in a monetary value, a regulation that costs 7 million dollars would directly reduce health care resources by about 1 million dollars. In this respect, it is possible that overabundant EJ regulations can indirectly damage people's health.

For instance, after the EJ Executive Order was issued, all federal funded projects were obliged to report on the effect of their projects on EJ. Before long, the Executive Office published further guidelines to clarify how to achieve EJ under the existing NEPA (National Environmental Policy Act) system (Council on Environmental Quality 1997). In the appendix to these guidelines, the human health effects were defined in terms of risks. That is, when determining the existence of disproportionate human health effects among populations, according to the guidelines, this should be measured in the form of risks. The received risks/rates are further compared with those present in the general population. In so doing assessors can determine whether minorities are exposed to greater risks (Council on Environmental Quality 1997:26). In short, agencies have to conduct *both* spatial and risk assessments to identify the effect of a project on EJ.

Needless to say, all this research costs money, but attitudes widely diverge over how public money should be spent. The second- and third-wave adherents are firmly opposed to spending more money on EJ research, citing misplaced priorities such as poverty/health over pollution. For them, it is groundless to conduct risk assessments on a case-by-case basis since this may result in spending too much time and public money on unfeasible goals. They argue that one million dollars can be used to pay

for a few annual health exams, which may considerably reduce the death rate. After calculating costs and benefits of EJ, it is argued that regulators should *not* further invest in EJ; instead, the money should be redirected to health protection schemes. In this light, it is argued that pursuing EJ may be indeed detrimental to the health of minorities, since attention is turned from more important issues, such as poor health care (Graham and Wiener 1995; Graham 1995a; Foreman Jr 2003).

Adherents of the first wave hold a more ambivalent attitude towards further research. On the one hand, they know very well the limitations of the traditional EJ approach. Without addressing the issue of *risk* directly, it is clear that the future of EJ is unpromising. For instance, after Bullard's intensive research on Houston, he concluded that Blacks were more likely to live near waste disposal sites than Whites (Bullard 1983). For this reason, it was argued that the situation in Houston was unjust. A conclusion of this kind assumes that there must be some potential health problems associated with these sites. Additionally, it is assumed that residents of the neighbourhoods nearest to the sites will be the ones to suffer ill health. However, since none of these arguments is confirmed via risk analysis, the third wave camp continuously challenges this conclusion. Risk analysis is the only choice available to break the deadlock and achieve EJ.

In spite of the limitations of the traditional EJ approach, to accept the risk approach unconditionally may not be the best strategy for the EJ movement either. The danger is that research itself will become a goal in and of itself, rather than a means to ensure the achievement of EJ. To this end, the current risk assessment system came under strong attack from concerned EJ activists. Activists argue that present process of risk assessment indeed has nothing to do with environmental protection. Rather, the real goal of such assessments is to provide some grounds for regulation. Regulators however conceal this goal in a pseudo-science form, i.e. risk assessment, to discourage public and judicial oversight (Montague 1995; Shere 1995:472-473). In other words, risk assessment formulises the assumption that risks can be, or should be, calculated by experts; accordingly, once EJ is translated into the language of risk, it will be turned into technical terms even though its scope should go far beyond the

technical.

Before long, first wave's ambivalent attitude toward risk assessment was attacked by the third wave hardliners. They have gone so far as arguing that EJ supporters could not care less about risk analysis since it rarely be used to guide their advocacy priority. The influence of EJ, they claim, does not come from its authentic commitment to risk analysis, but from its promise for providing something bigger and more uplifting. For instance, minorities usually feel overwhelmed by something that they cannot control; the uncontrollable causes an angry outcry to improve their collective quality of life. By repeatedly asking for more research on "multiple, cumulative and synergistic risk", which is too complicated to be fully understood, EJ has become an unachievable goal. Yet, because it is unattainable, EJ movement could remain influential in shaping politics (Foreman Jr 2003). In a word, after introducing the language of risk into EJ, EJ finds a new course as scientific discovery. To the third wave adherents however, EJ advocates only use risk, and risk analysis, as a political leverage. Therefore, they accused the EJ movement of taking advantage of the fear and anger among minority groups.

In this light, it is argued that under the guise of health/environmental protection, EJ activists and researchers are indeed passing their own judgements onto others. On the one side, EJ activists demand proof; however, when the evidence suggests otherwise, they contest the evidence and label risk assessment as pseudo-science (e.g. Knox 1996; Montague 2004). In short, EJ activists place themselves on the side of victims (the most vulnerable) and then pose its challengers as indifferent, sometimes even hostile, to justice and the environment (cf. Tesh and Williams 1996). By so doing the assumption that EJ should be located on the highest priority has been imposed onto others.

Needless to say, EJ activists take this demand for hard evidence as an excuse that helps the polluters skilfully evade from the responsibility that they should have taken. Knowing that most data are *not* in, industry knows, they argue, that EJ struggles can never win a battle in the field of science, which requires a high level of proof (see

below). Therefore, industry and its allies deliberately ask for “hard” data to de-legitimise the EJ arguments. One example for this is the Monsanto case in East St. Louis, Illinois. This company has produced dioxin in its compound for fifty years. When the EPA found dioxin contamination in the proximity of this plant, Monsanto however refused to clean it up. There is no denying, Monsanto argued, that this company have manufacturing things that create dioxins. Nonetheless, there is no evidence whatsoever to prove the found dioxin are “theirs”. Evidence is demanded before they take any actions (Cole 2008:577). For the industry, categorising EJ in a risk frame has become a way of denial which sets them free from almost any responsibility.

Intriguingly, both EJ advocates and their opponents agree that EJ struggles are *not* about scientific truth, not even about right and wrong. They are struggles about economic and political power and the practice of that power (Foreman Jr 2003; Cole 2008). For activists, the truth, data, or research will not “set you free”. Therefore, it is mistaken to believe, they stress, if one is right or on the side of truth/science/data/information, then EJ will win. The truth/science is only an organising means to rally support for EJ, not the end. Truth is essential but EJ can never win in a struggle just because we have truth on our side (Cole 2008).

Not surprisingly, people supporting the viewpoint of industry argue that if EJ has nothing to do with truth, right and wrong, and other things, why should we talk about EJ? Considering the fact that we know so little about the possible risk, including its nature, magnitude, severity, toxicity, and likelihood, "It's hard to start developing solutions until we define what the problem is," as an industry attorney contended (Kelly 2003). Under the banner of better jobs, it is argued that EJ has become a new “green ideology” which denies poor Blacks good jobs (Kelly 2003; Gee and Payne-Sturges 2004). What is more, it is suggested that “unless good data on cumulative exposure is developed”, we should think about the consequences of EJ, such as losing jobs (Kelly 2003). As the third wave has addressed: Nothing can be done until all the data are in (Timney 2002).

Before starting my analysis on the process of risk assessment, I shall now turn to explore a series of subsequent debates surrounding the risk analysis. From the analysis below, one can easily see why both EJ and its contenders support a risk-based approach.

5.2.3 The devil is in the database: Shifting the database, shifting the results

Currently, there is wide variation in the datasets used to test the EJ hypothesis. Researchers select various databases which serve their ends best to interpret the phenomenon of EJ. An issue that has been overlooked in the literature is that mixed findings can be result of the way databases are selected. In this section, three databases are closely followed to reveal how the selection of database influences its findings.

5.2.3.1 The TRI and RCRA datasets: Which database can represent EJ best

TRI (Toxic Release Inventory) is a broadly used dataset in the field of EJ research. TRI was created by the US Congress after the disastrous release of toxic chemicals in Bhopal catastrophe. Businesses in certain industries are required by law to report the locations and quantities of certain chemicals that they release to the environment to the EPA. Meanwhile, the EPA has also been required to annually collect data from those regulated industrial facilities, and make the data available to the public through TRI. Thus, TRI is a national database with the aim of empowering citizen through information:

> The Toxics Release Inventory (TRI) is a database that contains detailed information on nearly 650 chemicals and chemical categories that over 23,000 industrial and other facilities manage through disposal or other releases, recycling, energy recovery, or treatment. The data are collected from industries including manufacturing, metal and coal mining, electric utilities, commercial hazardous waste treatment, and other industrial sectors. (US EPA 2008e)

A programme like TRI creates political and economic pressure on firms' performance. To avoid being put on the worst emitters list, companies voluntarily cut their emissions. For instance, the latest TRI suggested that from 2007 to 2008 total disposal decreased by 257 million pounds or 6% (US EPA 2008f). In the original 299 reportable chemicals, the release drops astoundingly by almost 60 percent (OMB Watch 2005). As some commentators argued (Morello-Frosch and Jesdale 2006; cf. Atlas 2007), the TRI is perhaps EPA's most successful regulatory tools and over all these years it has become the foundation for right-to-know laws.

Thanks to TRI, host communities eventually have access to the reportable information because these communities can use TRI to trace toxic facilities' own estimates on which chemicals and what volume of them are released into the environment. However, there are some obvious limitations in TRI. For one thing, the breadth of TRI reportable pollutants is very restricted. Only about 650 of them are tracked by the TRI; however there are around 80,000 chemicals which are approved for commercial use. For another, the data recorded in TRI are estimated by the factories but not by impartial bodies. As a result, emissions are often estimated, rather than being measured directly (Ringquist 1997; Environmental Integrity Project 2004; Freudenburg 2005:93 ff.; US EPA 2008f:813-814). Thus, the reliability of TRI is often criticised. Even so, TRI database was widely used as the surrogate to investigate the spatial relationship between risks and the racial/economic character of the host communities (Cutter, Holm et al. 1996; Pulido, Sidawi et al. 1996; Pastor, Porras et al. 1999; Stewart, Schneiderman et al. 2001).

Table 5.2: Previous research on EJ

Study	Pollution Measure	Geographic Unit	Geographic Scope	Race Effect	Class Effect
United Church of Christ, 1987	Commercial TSDFs	ZIP code	United States	Yes	Yes
Burke, 1993	Count of TRI facilities	Census tract	Los Angeles County	Yes	Yes
Zimmerman, 1993[a]	Superfund (NPL) sites	Census place	U.S. nonrural communities	Yes	No
Anderton et al., 1994	Commercial TSDFs	Census tract	Metropolitan areas containing at least one TSDF	No	No
Bowen et al., 1995 (Analysis I)	Index of TRI release levels weighted by toxicity	County	Ohio	Yes	No
Bowen et al., 1995 (Analysis II)	Index of TRI release levels weighted by toxicity	Census tract	Cuyahoga County, Ohio	No	Yes
Perlin et al., 1995[a]	TRI releases	County	United States	Yes	No
Pollock and Vittas, 1995	TRI releases weighted by distance from source	Census block group	Florida	Yes	Yes
Cutter et al., 1996[a] (Analysis I)	Counts of TRI, CERCLIS, and TSDF facilities	County	South Carolina	No	No
Cutter et al., 1996[a] (Analysis II)	Counts of TRI, CERCLIS, and TSDF facilities	Census tract	South Carolina	No	No
Cutter et al., 1996[a] (Analysis III)	Counts of TRI, CERCLIS, and TSDF facilities	Census block group	South Carolina	No	Yes
Anderton et al., 1997	Superfund (NPL and total CERCLIS) sites	Census tract	United States	No	No
Been, 1997	Commercial TSDFs	Census tract	United States	Yes	Yes
Boer et al., 1997	Permitted TSDFs	Census tract	Los Angeles County	Yes	Yes
Brooks and Sethi, 1997	Index of TRI release levels weighted by toxicity	Zip code	United States	Yes	Yes
Cohen, 1997[a]	Releases of 3 TRI chemicals	County	Indiana	N/A	N/A
Markham and Rufa, 1997[a]	Municipal solid waste and sewage disposal sites	Census tract	49 U.S. cities	No	No
Ringquist, 1997	TRI facility locations and release levels	ZIP code	United States (residential ZIP codes)	Yes	Yes

Source: (Daniels and Friedman 1999:249)[69]

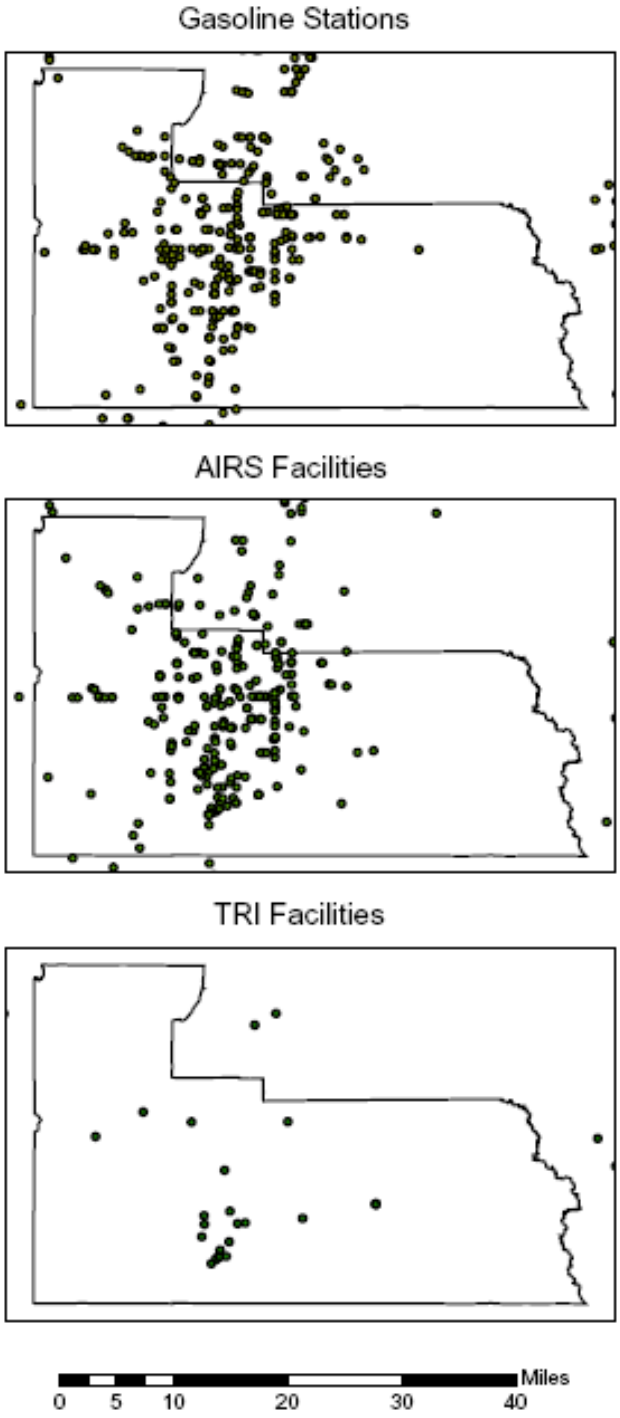
Although TRI is commonly used, some EJ studies have utilised the siting data from EPA's RCRA database (Resource Conservation and Recovery Act)(Cutter, Holm et al. 1996; US EPA 1997; Ahearne 2000; Pulido 2000). RCRA sites are those hazardous waste sites that generate, transport, treat, store, and dispose of hazardous waste. Among all these sites, there is a specific TSDFs/TSDs database which deals with permitted RCRA treatment, storage or disposal facilities; a body of EJ research specialise in TSDFs or hazardous waste sites (see the table above). Under the RCRA, such facilities have to provide information of its activities to state environmental agencies because this type of facility poses some additional risk to the locals, particularly in case of fire, accidental explosion or release, or illicit discharge (Boer, Pastor et al. 1997). Most scholars justify their selection of TSDFs by arguing that this dataset can not only represent a potential health threat but also reflect government permitting process for siting and operation (Been 1995; Boer, Pastor et al. 1997). As a result, it is argued to be most suitable for EJ studies.

Both TRI and RCRA sites pose a "potential" danger for host communities; otherwise

[69] In the second column (pollution measure), it is clear that most studies focus on the TRI and TSDF datasets.

there would be no need to list them with the EPA. In this light, both choices make perfect sense as EJ indicators. However, looking closely into the databases, one can easily identify some innocuous and less offensive places, such as gas stations, dry cleaners, and auto mechanic shops in the RCRA list (US EPA 1999). Thus, most of the listing sites, as one can easily guess, belong to the category of less offensive. For instance, although there were only 59 toxic release sites on the TRI list in Queens County, New York, there were over 1600 RCRA sites in the area and 45 percent of those are gas stations or dry cleaners (Stewart, Schneiderman et al. 2001). Differences quickly arise among scholars on the issue of how to deal with these less risky sites. The figure below provides an illustration on the selection of databases.

Figure 5.1: Three different indicators in EJ research



Source: (Zandbergen and Chakraborty 2006)[70]

[70] AIRS refers to EPA's Aerometric Information Retrieval System. This database contains mostly small facilities, like dry-cleaning shops or auto repair shops. These small facilities do not fall under the regulation of TRI.

From this example, even a layperson can easily recognise that findings can be affected by the exclusion and inclusion of these minor sites. Moreover, beneath the surface claim of which database can represent EJ best, a much more fundamental debate is embedded elsewhere: How dose one interpret the risks that a release has on a neighbourhood?

For those who chose RCRA/AIRS sites, their choice implies a mentality that no matter how small the risk is, these less offensive sites still pose a immediate threat to the locals. Conversely, the choice of TRI implicitly indicates an attitude that even though minor offensive sites do pose some threats to the public, only the most "risky" ones are worth our attention. As most second- and third-wave allies have constantly contended, our society should stop worrying about some minor issues; more resources should be redirected to more important things like public health and health education (Breyer 1993; Cross 1995; Foreman Jr 1998). The BRS case below provides an example on how EJ devotes all its energy onto some sources of risks but ignore other more significant risks. This random agenda selection has been sharply criticised by some observers.

5.2.3.2 BRS database: Hazardous waste generator case

It may surprise some that while TRI and TSDFs are the most commonly used in EJ research, these two databases indeed account for only 2% of total released hazardous waste volume in the US (Atlas 2002:368). As noted, EPA defined hazardous wastes as those that pose dangers or potential harms to the environment or the public. Accordingly, unlike normal wastes, normally known as trash or garbage, that can be discarded in municipal landfills (more information see: US EPA 2009 a; 2009 b), facilities which generate hazardous wastes are under stringent regulation to assure they are handled and managed with special precautions. To do so, EPA constructed Biennial Reporting System (BRS) database to collect information and regulate these generators accordingly.

According to the EPA, there were 700,000 to 1,000,000 hazardous waste generators

in the US. In comparison, there were only 2025 TSDFs and 21,490 TRI facilities (Atlas 2002:368). In numbers, as seen, BRS dwarfs other facilities. Since they are the largest sources for emission, it is not hard to imagine that their waste volume is also beyond comparison. Again, according to the EPA, in 1995 BRS facilities generate more than 1.1 trillion pounds of hazardous waste; the number for TSDFs however is only 21 billion pounds in the same year. Comparing 1.1 trillion with 21 billion, one can easily recognise that only 2 percent of the generated waste was shipped for off-site management while 98 percent of it was managed on-site. If hazardous waste is considered an EJ threat to the host community, given that the waste sent to TSDFs must be produced somewhere, it seems indefensible not to take these generators into consideration when conducting EJ research.

Strikingly, although hazardous waste generators vastly outnumber any other environmental control programmes, according to Atlas (2002) before his seminal research was published in 2002, no published study had concentrated on these generators. It means that researchers favour TRI and TSDFs with little formal justification. However, by choosing TRI and TSDFs databases, current EJ studies provide a very skewed, if not misleading, picture which focuses on the residual 2% of waste but ignore the other 98 percent altogether. Since one cannot get the whole picture from a database which covers only 2% of the waste, the issue on dataset selection trivialises all other debates. To some, the seemingly random way that risks make it onto the agendas of EJ has caused a systematic problem.

5.2.4 Actual risk vs. perceived risk: Fiction or fact?

The issue on dataset selection begs another significant question: Is a TSDF by nature more dangerous and risky? Often in the literature, researchers make no mention of dataset selection; therefore, the substantive findings themselves cannot provide the answer. A TSDF refers to a facility that handles (more specifically treats, stores or disposes) hazardous wastes for other bodies for commercial reasons. Because a TSDF deals with dangerous wastes, a facility like this is heavily regulated by the permitting and operating standards; otherwise the EPA will not need a list to regulate

them. In this respect, TSDFs are the safest of its kind. For a hazardous waste generator where the generated waste is managed on-site, no such permits are needed. In the end, since TSDFs are heavily controlled, they are, at least in theory, already safer than the uncontrolled generators.

As Atlas (2002) argued, the reason why TSDFs are scrutinised by EJ is *not* because their equipment or process itself is inherently more dangerous. The actual reason is because the waste they are handling is more hazardous and accordingly the facility is also *perceived* to be more "risky". For Atlas, if the presence of hazardous waste is the concern, it seems less meaningful to focus on the known safer TSDFs but ignore the unknown unsafe/unregulated generators. The third wave contenders take a step further. For them, the selection of TRI and TSDFs reflects nothing but the bias of EJ. They criticise the activists for failing to speak to technical questions of harm or risk, but speak to people's fear and anger (Foreman Jr 2003:185). Due to inevitable limits of public attention and selective coverage, EJ stays in where it knows the best, perceived risk. This EJ perception on risks then reinforces the idea of what constitutes EJ.

Similar example can be found in the case of Superfund sites as well. A few studies concentrate on Superfund sites on the basis that these sites pose a great threat to the locals (Stretesky and Hogan 1998; Noonan 2006). To some extent, Superfund sites are most dangerous. Still, proximity to a Superfund site reflects neither the level of exposure to any chemical at that site, nor the level of any health-related impacts from the site. To this end, the waste management industry (McDermott 1994) demands further proof that their sites impose more *actual* risks than others to the environment or human health. Without valid evidence, critics argue that EJ can never achieve its ultimate goal, reducing risks.

The industry (McDermott 1994:691-694) further complains that the data selection of EJ reflects nothing but our society's double standard. The waste generators are considered as a necessary evil for economic development, so our society is more likely to tolerate and to bargain with the industry over the level of emissions. For

waste management industry, however, an essentially zero-emission/tolerance standard has been set. This double standard implies that our society is more tolerant towards high-volume releases of less toxic chemicals than lower-volume releases of highly toxic chemicals, even though the latter may be in fact safer. Consequently, the industry argues that while it is entirely understandable why residents concern about the health and safety of their communities, their concerns cannot be backed up by scientific evidence. From the industry's viewpoint, residents are indeed afraid of their imagination which they perceived. This perceived risk however is not the actual risk that they are facing. Under this thinking, industry formulates risk as the equation "Risk= Hazard + Outrage" (Sandman 1993). In a typical case of EJ, they complain that outrage (perceived risk) wins all the time:

> I do not think it is a question of what the experts tell us; it is a question of what the great body of the people are afraid of. (cited in McDermott 1994:691)

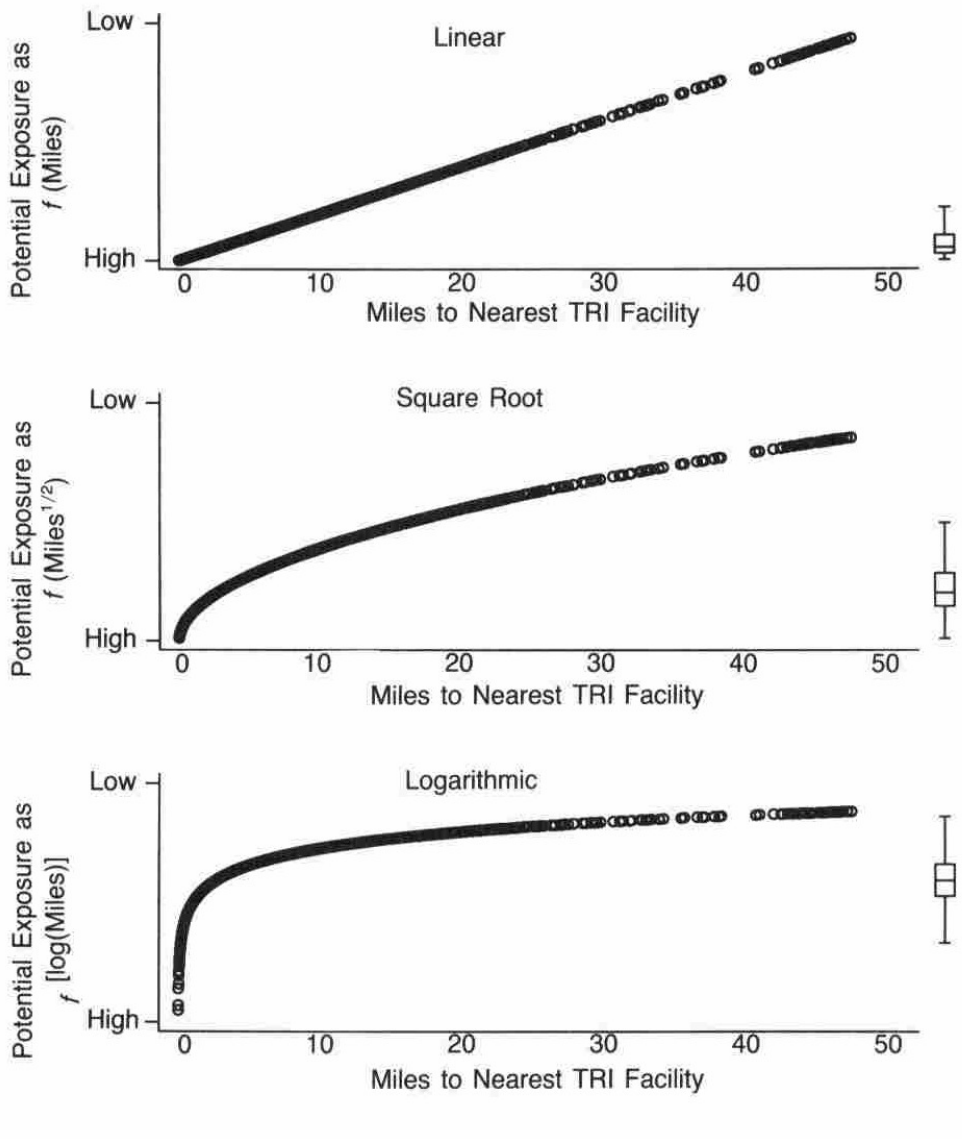
Ironically, as some argued, since the perceived risk of hosting a facility is continually exaggerated, the NIMBY syndrome will consequently increase. The result is that the political powerless and voiceless are actually more, not less, likely to become the target of such a facility. That means, the locals will not benefit from EJ. For one thing, EJ struggles may win the battle but lose the war. In other words, what they have done is simply pushing the facility into another equally vulnerable community which may be less suitable for such facilities (Schelly and Stretesky 2009). For another, it is true that exposure to toxic waste takes 3 to 40 days from life-span, poverty reduces one's life expectancy by an average of 10 years (Friedman 1998). Because the public, the EJ movement as well, is fighting with their perception of risk, they mistakenly single out commercial waste management companies (TSDFs) as their major enemy. This choice is mistaken because, as discussed, TSDFs handle only 2-4 percent of the waste. The main pulpit, waste generators, responsible for 96-98% of the waste however were completely ignored by the public. Without clarifying the issue of risk first, no one really wins, they argue.

Risk, the industry further explains (McDermott 1994:699), should be defined as a

function of *exposure*, not simply of proximity. That means, the industry adopts the most stringent definition of risk and asked for direct measurement of actual exposure. The EJ movement, on the other hand, accepts a laxer definition, sometimes implicitly, and defines risk as a function of *proximity* (Pollock, Vittes et al. 1992; Ringquist 1997). In the latter, distance, no matter how it is gauged (metric measure, zip codes, etc.), is used as a surrogate for exposure/risk. Under this definition, it is assumed that people living closer to a facility are exposed to higher risks than those living far away from the site. Exposure/risk here is understood as some function of *distance*.

The problem is, what is the shape of this function? Is it linear or non-linear? If the exposure function is linear, then it implies that when one moves from a point 2 miles away from a facility to a point 1 mile away, the increase in exposure is exactly the same with other one-mile moves, say, from 5 miles to 4 miles distance. In contrast, if it is non-linear, then the close-in one mile move brings a greater increase in exposure than that of a further-out one-mile move. Below is an example which demonstrates three theoretical exposure functions:

Figure 5.2: Potential exposures and proximity: 3 models



Source: (Pollock and Vittas 1995) [71]

As noted in the impact circles cases, most EJ spatial research implies a linear function between exposure and distance. For instance, Mohai and Bryant (1992) illustrate a linear model of exposure in which residents live at the point of 0.1 mile away are assumed to be exposed to 10 times more exposure than those living 1 mile away. Although epidemiologists continue to debate on how exposure acts in real life

[71] The top graph shows a linear function between distance and exposure; the middle demonstrates exposure as the square root of the distance; finally, the bottom illustrates exposure as the natural log of the distance.

(see below), it is hardly surprising to see that the function of exposure does not work in a linear way. In the illustrative example above, the middle graph (exposure as the square root of the distance) would show that in a close-in one-mile move (say, from 1.5 to 0.5 miles) the increase in exposure is about 3 times more than a farther-away one-mile move (say, from 10 to 9 miles). More dramatically, in the bottom graph it would measure the increase as a tenfold difference (Pollock and Vittas 1995).

Once again, as we can see: shifting the models, shifting the results. As some third wave observers assert: What are the EJ policymakers supposed to do when confronted with these result? (Rhodes 2005; Noonan 2008) Since the actual effects of LULUs are largely unknown, scholars from all sides demand an EJ risk assessment. That is, instead of using distance as a surrogate to estimate exposure, it is argued that we should measure risk directly. Now I turn to risk-based EJ assessment.

5.3 Risk matters, but how?: Risk-based EJ assessment

As seen, in most EJ spatial research the concept of risk is treated as a function of distance. Generally, the further you live from a plant the safer you are. Since it remains unclear at what spatial scale/distance the potential effects of facility on residents are expected to occur, all parties require that authorities conduct EJ risk assessment to measure the actual risk on the locals. Since EJ risk assessment is a newly budding area in EJ, a full picture on how EJ and risk assessment can be combined and conciliated is still to be painted. In this section, I closely follow the four steps formulated by the Red Book (National Research Council 1983). Firstly, I describe the characteristics in each step; then I turn to analyse the EJ concerns in the step.

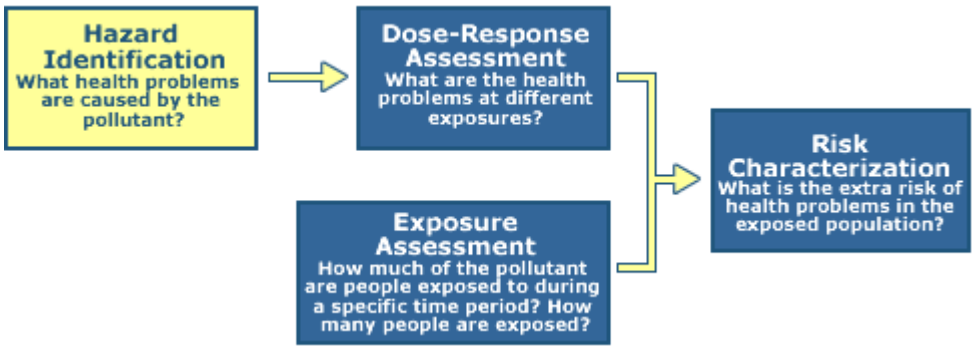
5.3.1 Hazard identification

5.3.1.1 One risk at a time

To examine the human health effects from a substance, EPA set up its four-step risk

assessment procedure. Most risk assessments start with the step of hazard identification. The process of hazard identification is used to determine what health problems are caused by a pre-given pollutant (Patton 1993; Israel 1994; US EPA 2008a). Considering limitation of cost and proper procedures, instead of targeting a mixture of substances, only one single, or simple, form of stressors is assessed in this step. As a result, there is only one risk being assessed at a time.

Figure 5.3: The first step in risk assessment process



Source: (US EPA 2008a)

There exist several kinds of EJ biases regarding the initial decision to conduct a risk assessment. Firstly, the process begs the question of why to choose this specific risk. As we can see, although concentrating on one pollutant has advantages on less costs and easier generalisation (Israel 1994:483-484), this oversimplified reductionist approach invites a number of EJ concerns regarding the informational bias. For instance, some minorities are exposed to lead owing to their diet (mainly from fish consumption). Here comes a question: Since most Americans do *not* consume as much fish as minorities do, should authorities conduct a risk assessment to cover the last, say, 2% of the population? (Heinzerling 2000) As one can imagine, some argue that a risk assessment like this is a waste of public money. In so doing, a certain chemical was treated as secondary and then excluded from the process.

The second concern having started to surface is the contributor's dilemma (Shrader-Frechette 1986) or the synergistic (1+1≠2) syndrome (Kuehn 1996:117ff.). Obviously, although a single-risk exposure can be simulated in the laboratory, people are seldom

exposed to only one pure/single pollutant. In the real world, after being released in the air or water, pollutants from different sources cumulate, interact, or even mix with other chemicals. Therefore, different effects occur faced with various scenarios. The two most common scenarios are multiple exposures (contributor's dilemma) and synergistic syndrome. Multiple exposures occur when people are exposed to numerous pollutants from various sources on a daily basis; synergistic syndrome, on the other, happens when pollutants mix or interact with other pollutants in the environment. It is disputed whether or not EPA's single pollutant approach could account for such multiple exposures and chemical mixtures.

When a person exposes to multiple sources of pollutants, usually this person is experiencing an aggregate of risks, each of which alone is considered acceptable; its cumulative effects however are not (Corburn 2002). If this person is exposed to a high level of a pollutant already, then even the smallest amount of additional exposure may still cause serious consequences. To put it in another way, exposing to an identical amount of exposure or risk, its consequences may not be the same. Thus, it is argued that EPA's single exposure assumption ignores the cumulative effects and accordingly invites serious EJ concerns (Shrader-Frechette 1986). As noted in the *Equity Report*, it is discovered that people of minorities are exposed to a higher level of existing pesticides. From an EJ perspective, if the communities already have a higher exposure, it seems inappropriate to impose one single standard onto everyone, as the standard is set for the protection of general public who have less existing exposure. In this respect, single exposure approach fails to deliver the needs for the most vulnerable. In a word, treating the most vulnerable equally as treating the general public is *injustice* in itself.

The third EJ concern is regarding the selection of health effects in the risk assessment (Israel 1994). While EPA has noted that one stressor may be responsible for different adverse effects onto human body, most risk analyses target on only one or few observable/measurable effects (endpoints); normally cancer/carcinogen is selected as an index of such endpoints. The initial decision on adverse effects begs a question of which effects to choose and which to ignore. The selection of health effects is often

taken for granted; however it is a cause for EJ concerns.

There are a number of reasons that may lead to the decision for choosing cancer as the major index. For instance, it is relatively easier to identify syndromes/tumours caused by cancer. Also, cancer is considered to be the most sensitive endpoint so that it can be used as a safety net for other endpoints. Needless to say, the rate of cancer often attracts great public attention as well (Israel 1994; Jasanoff 2009). For all these reasons, it is not difficult to understand why carcinogen risk assessment has become one of its kinds. The EPA also follows the trend of cancer research. On the website of "The Risk Assessment Portal[72]", it has demonstrated the tendency that EPA is dependant on carcinogenesis as its single important endpoint. Other health effects are largely left out from the outset of its assessment. Due to this policy preference, non-cancer-related research suffers accordingly (Israel 1994).

This unbalanced focus on cancer will undoubtedly raise an EJ concern. As noted in the *Equity Report*, it is obvious that EPA has recognised the problem that minority children were especially vulnerable to lead-related diseases. Even so, under its narrowly defined health "effects", lead poison has not been taken into full account by the EPA. Surely, there are some practical reasons that delay the decision of EPA on whether to put lead onto its top priority (Israel 1994). Precisely, lead poison is notoriously difficult to detect. Its symptoms, endpoints, are concentrated on nerve system and the attendant behaviour effects. Without a simple endpoint, such as tumours, it is hard for researchers to measure the mechanism of lead poison. For convenience, risk assessors decide to stay in the field where they know the best, i.e. cancer; lead was largely ignored. The ignorance about non-cancer research is not unusual:

> There are more than 70,000 chemical in commerce, and we know very little about the toxicological properties and degree of public and environmental exposure to most of them. The limiting step in advancing risk assessment is not necessarily methodologies or procedures but the availability of data on human and environmental exposure, transport, and fate of toxic substances in the environment, and the effects of these substances on biological systems.

[72] See: http://www.epa.gov/risk/ .

(cited in Knox 1996:55)

In a word, due to selective coverage non-carcinogenic pollutants are neglected simply for the reason that it does not cause cancers which scientists know most (Jasanoff 2009). From the very beginning of its procedure, risk assessment fails to present the risks shouldered by all segments of the population. Therefore, it is argued that from the very first step risk assessment is inherently problematic. This biased nature is critical for us to observe further from the perspective of EJ.

5.3.1.2 But is it a threat?: Which chemicals (water, hog/pig waste, cement kiln dust, or pesticide) are considered hazardous?

Before starting a risk assessment, it is crucial to decide whether a specific substance is toxic. However, people continue to debate whether (and then which) EJ issues should be considered in the regulatory process. To some extent, a regulator's decision on which risk to control is purely based on his/her value judgement. For instance, is (pure) "water" safe? Drinking too much water can cause serious water intoxication, sometimes lead to immediate death (BBC Magazine 2007); yet, barely is it considered "risky". Questions raised in this stage of assessment concern the nature of a hazard (which substance is hazardous?), its epistemology (can one ever know?), and its consequences (If one cannot, then what?).

Regarding these questions, EJ advocates, as one can imagine, strongly against the assumption that experts/scientists know what is actually hazardous while lay people only have perceptions over those hazards (Tesh 1999; Checker 2007). Most assessors and regulators (Thompson 1986; Reilly 1993) however argue that they are *not* naïve enough to believe that they know all the answers; what they did, according to them, is in fact to combine their scientific observations with their value judgements. Therefore, it is continuing to permeate in the field of risk regulation that nothing is absolutely safe and each individual has his/her own standards to judge risk. As the former EPA director said,

> [A]s Senator Moynihan once said to me, "Well, knowledge is sorrow,

> really." To the degree that we understand that there are trace amounts of carcinogens on our food from pesticides, or even in natural products like coffee or peanut butter, we ourselves have to acknowledge that we are making these choices and tradeoffs of the kind that the public radio criticized…. The regulator, then, is in fact, however, doing nothing different from what you and I do every day. (Reilly 1993)

Since a regulatory decision has no difference from normal people's daily decision, the regulatory determination over which risk/chemical to be assessed is very dependent upon agreement on what constitutes "risk" and how to demarcate risky chemical from others. Facing the question of demarcating risky chemicals from safe ones, for industry the best strategy is to block a chemical from being listed as poisonous in the first place. In so doing, the sequent risk assessment will not even be started. One may think that the previous water-intoxication is an extreme case so that it is harder to judge from this case. In daily life, one may argue, questions like what is hazardous and how we know it is dangerous should be relatively straightforward. It is however not the case.

Hog/pig waste (Wing, Cole et al. 2000; Taquino, Parisi et al. 2002; Wilson, Howell et al. 2002; Wing 2002; Stretesky, Johnston et al. 2003) is one such example. Recently, hog farms have quickly attracted the attention of EJ because this industry is regarded as risky. With the rapid industrialisation of hog production, high concentrations of animal waste became a problem for local communities. Unsurprisingly, these farms have rapidly fuelled the local opposition and before long hog issues are deemed to be an "EJ" one.

The case of hog-farming is interesting and somewhat contentious. On the one hand, hog farms are certainly a nuisance, and thus it seems appropriate to introduce EJ methodologies and EJ languages into analysing the distribution of these farms. That is, as any other EJ threats, these farms are treated as industrial LULUs which are posing unequal burdens/risks onto the residents, especially the poor, the elderly and the minorities. Yet, it cannot go unnoticed that although scholars use the language of "industry", "waste", and "environmental risks", the nature of animal wastes is completely different from that of the industrial wastes. To a degree, animal waste is

nothing but nature itself; that is, nuisance maybe but definitely not a "hazard". If that is the case, it begs the question of whether or not it is justifiable to trigger off a "hazard" identification procedure on the "hog/pig" issue.

The necessity of such "hog/pig analysis" will almost certainly be challenged. For instance, if hog problems are an EJ one, then it seems unaccountable that the EPA ignores other "pure" industrial emission sources, like gas stations, auto body paint shops, or dry-cleaners, but singles out a "natural" hog waste. Still, we also have some other EJ issues, like coke plants[73] (Graham, Beaulieu et al. 1999), illegal drug production sites (Sicotte 2008), which people may think it more important. One may ask: Why single out the minute *hog* issues? It is more than clear, as some commentators said (Shere 1995), that the EPA and EJ activists evaluate some kinds of risks to public health, while ignoring other risks entirely.

Arguably, most EJ research concentrates on "industrial" waste, and thus the previous cases are somehow uncommon. However, in a case of pure industrial the demarcation of what is hazardous is similarly uneasy to answer. Take the case of cement kiln dust (CKD). Before making its final decision on whether or not to warrant an additional control on CKD, the EPA conducted a research, *Race, Ethnicity, and Poverty Status of the Populations Living Near Cement Plants in the United States* (US EPA 1995), to address EJ concerns. In this regulatory determination report, the EPA indicated that subsistence home-grown farmers and subsistence fish consumers are more susceptible to risks posed by CKD. These EJ concerns were later invoked by the EPA as one of the reasons for regulating CKD. Unsurprisingly, CKD companies opposed the proposal for listing the dust as a hazardous waste:

> [p]olitical concerns such as 'environmental justice' are not among the specified statutory factors [in the Resource Conservation and Recovery Act (RCRA) and] whether there are disproportionate numbers of racial minorities or poor people living around cement kilns is wholly irrelevant to the regulatory determination. (cited in Bunting 1995:147-148)

[73] Contrary to the name coke plant might imply, here the word of coke has nothing to do with Coca-Cola or cocaine. A coke plant refines heavy residual oils into lighter, more valuable motor fuel.

Even today, in a softer tone the CKD industry is still reluctant to accept this re-classification. They complain that the CKD industry has begun to hire environmental professional on staff and to catch up state-of-the art pollution controls; the regulatory agencies however have been "skittish" about issuing permits. That is, "local concerns" has become the most important thing in the permitting decision; unless "local concerns", they argue, are addressed from the very beginning, it is harder for them to get a permit to build or modify their facilities (Weiss 2000). Although the industry admits that they are major sources of emission, their argument implies that EJ is indeed a "perceived" concern, not an actual risk. It is suggested that technical/actual risk, not EJ, should be framed into the procedure of regulation.

This argument can go even further. As one may remember, the CKD case indeed is an echo of the *Equity Report* in which fish consumption and farmer's high intake of chemicals are confirmed in general. According to this report, it is almost certain that there is disproportionate exposure to agricultural chemicals among Latino farm-workers. However, an argument like this, some argue, is somehow misleading, since this pattern of exposure reflects nothing but the discrete exposure among various occupations. Thus, there is nothing new about the fact that farmers are more likely to be exposed to pesticide. If Latinos are more likely to work in a farm, then it is almost certain that one can find more pesticide in their bodies (cf. Bowen, Atlas et al. Online First).

The way evidence is interpreted is crucial, and the aforementioned alleged EJ findings were severely challenged by the second and third wave scholars. They challenged the very foundation of EJ in terms of risk. For most first wave proponents, EJ is a movement concentrating on "where we live, work and play"[74]. Under this definition, risks ought not to be distributed along these social settings. Its critics however insist, as seen in the "Which came first" debate, that some social distinctions imply individual choice and therefore they have nothing to do with differences in exposure to pollution. In this light, concentrating on the differences among various social settings (where one lives, works and plays) is in fact

[74] Some even published a book in this namesake (Novotny 2000).

meaningless, because it is common sense that people who work in a factory or reside in urban areas are more likely to breathe in dirtier air than those in rural areas. Moreover, a rural folk who breathes in cleaner air is not living in a risk-free environment as well. Rural people are more likely to expose to other chemicals, like pesticides. As a result, critics like Been dispute over the demarcation among risks. If, she argues, some chemicals are considered risky, how about half-way homes, homeless shelters, or other facilities? Sometimes, these built-environments are even more risky.

Criticism from the second- and third-brigades did not stop there. Other commentators (Cross 1992; Breyer 1993) dismiss the subjective selection that risks make it onto the EJ agendas. They recommend decision makers to ignore the public's perception on risks and urge us to notice the danger of relying on perceived risk in policy making. In their argument, EJ and its seemingly subjective risk choice may lead us to a more *unjust* situation because regulations cause risks and injustice as well. For instance, rich New Yorkers move to the suburbs for the reason of safety. However, statistics show that the death rate is much higher in the suburbs than in Manhattan. Thus, an EJ regulation on urban injustice issue is indeed *re-imposing*, not mitigating, the existing stereotype; that is, this EJ regulation implies that the minority/poor/urban areas are more risky, because they are poor/minorities/urbaners (cf. Pulido 2000). Some have gone so far as to suggest that EPA stops doing the job of health protection but returns to its original responsibility, i.e. "environment protection" (Shere 1995). They argue that it is time for the EPA to reconsider its responsibility and the capability of risk assessment.

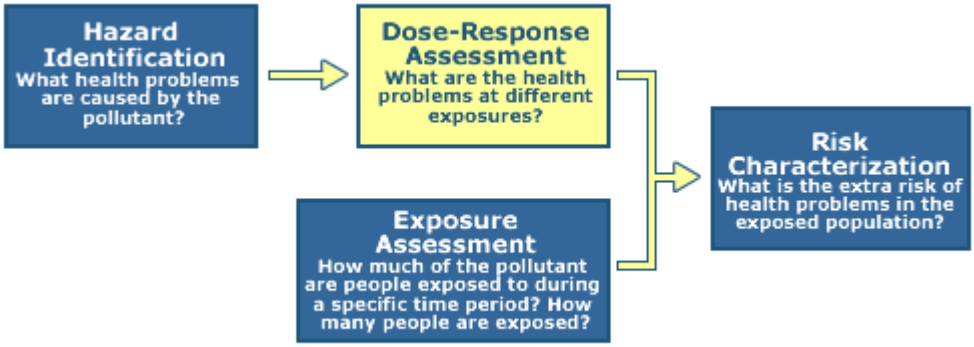
In a word, general consensus is lacking because people cannot agree on what constitutes an EJ risk. Critics challenge the idea that EJ concerns can be used to trigger a risk assessment. Further, these opposition camps argue, while some social groups can be identified with specific health risks, these risks in effect have nothing to do with "environmental" justice because they are the consequences of employment patterns, poverty, and urban decay. Accordingly as an agency in charge of "environmental" issues, the EPA should not do the job of "health" protection. As

seen, researchers from the opposition camps not only redefine what constitute EJ risks but also re-demarcate which jobs EPA should do.

5.3.2 Dose/Response analysis

5.3.2.1 Lab vs. real world

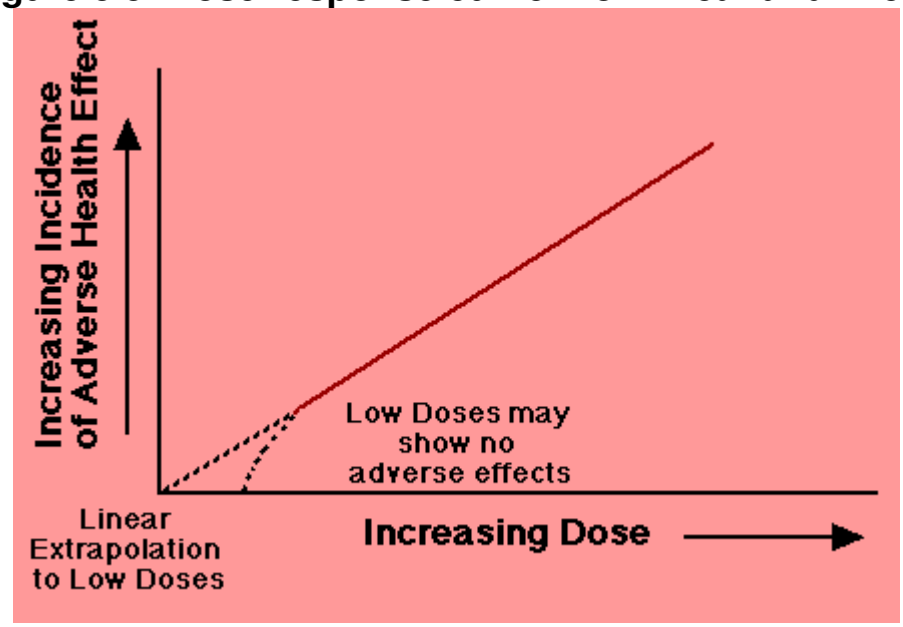
Figure 5.4: The second step in risk assessment process



Source:(US EPA 2008b)

The dose-response analysis, also called hazard characterisation, is the second stage in the process of risk assessment. After a pollutant has been qualitatively identified in the previous stage, this stage attempts to quantify and clarify the relation between the received dose of the identified pollutant and the likelihood/severity of its adverse health effects. Based on the previously identified mode of action (the understanding of how the toxicity is caused) the Agency now determines the nature of extrapolation through either non-linear or linear dose-response assessment (US EPA 2008b).

Figure 5.5: Dose-response curve: non-linear and linear



Source:
http://www.elmhurst.edu/~chm/onlcourse/chm110/outlines/doserespon.html

In the case of non-linear hazards, the organism shows its tolerance toward a threshold amount from zero to some finite value. In other words, below the threshold amount there is essentially no expression of the toxic effects (No-Observed-Adverse-Effect-Level); and the threshold of toxicity is where health effects start to be observed (Lowest-Observed-Adverse-Effect-Level). Under the mentality of precaution, EPA's research normally focuses on the most sensitive members of the population to assure that the 95-99 percent of population is covered in the regulation (Breyer 1994). Then, regulators establish a threshold to keep exposures below the set limit. For those toxics where the mode of action information shows no such a threshold, this type of toxins is called linear or non-threshold toxic. In this type of assessment, it is assumed that the effects of the toxic are linear, meaning that, even the smallest amount dose can still pose some likelihood of adverse health response (US EPA 2008b).

Because the epidemiologic data are sometimes unavailable, efforts are made to develop dose-response relationship from extrapolating the results of tests on humans or animals. Moreover, determining the health response to a substance may require to test on million rodents, scientists therefore have no choice but to use fewer animals at

significantly higher doses, and then use scientific models to predict the possible lower-dose response in human exposures. Therefore, in the dose-response assessment the so-called human exposure is developed from a prediction of mathematical models rather than direct observations in humans. As one can imagine, there are huge controversies, uncertainty and debates in this step (Kuehn 1996:113).

5.3.2.2 The dioxin case: Is it really important to get the dose right?

Dioxin is one of the hot spots in EJ struggles. Warren PCB protest is perhaps the most well-known (US GAO (U.S. General Accounting Office) 1983). Nonetheless, there are a series of controversies over dioxins. Contrary to common usage, dioxin is *not* a single substance of a defined toxicity but a complex *family* of at least 17 chlorinated organic compounds of highly variable toxicity (DioxinFact.org 2005a; US EPA 2009c). Within this family, furans and PCB are also members of it. Given this wide ranging family, some members of it are as much as 10,000 times less toxic than the most toxic ones (see the table below). What is more, combining with different media (emissions, sediments, foods, etc.), the toxicity of a given dioxin varies. In this respect, while almost all EJ advocates condemn the possible damage of dioxin, what we call dioxin is not a simple matter.

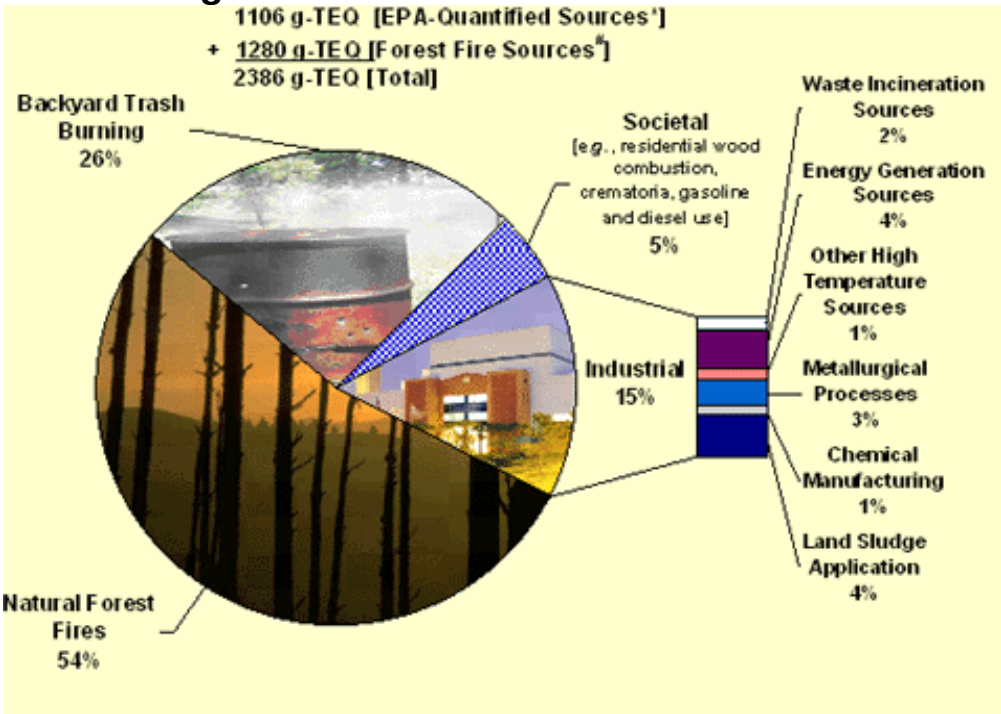
Table 5.3: The toxicities in dioxin family

*Dioxins**	*Toxic EquivalencyFactor (TEF)***
2,3,7,8-TCDD	*1*
1,2,3,7,8-PnCDD	*1*
1,2,3,4,7,8-HxCDD	*0.1*
1,2,3,6,7,8-HxCDD	*0.1*
1,2,3,7,8,9-HxCDD	*0.1*
1,2,3,4,6,7,8-HpCDD	*0.01*
OCDD	*0.0001*
2,3,7,8-TCDF	*0.1*
1,2,3,7,8-PnCDF	*0.05*
2,3,4,7,8-PnCDF	*0.5*
1,2,3,4,7,8-HxCDF	*0.1*
1,2,3,6,7,8-HxCDF	*0.1*
1,2,3,7,8,9-HxCDF	*0.1*
2,3,4,6,7,8-HxCDF	*0.1*
1,2,3,4,6,7,8-HpCDF	*0.01*
1,2,3,4,7,8,9-HpCDF	*0.01*
OCDF	*0.0001*
** The term "Dioxins" here refers to 7 dioxin and 10 furan chemical compounds.* *** Developed by van den Berg, et al., 1998*	

Source: (DioxinFact.org 2005a)

Concerning dioxin, there are two sides to the story. The good news is, no manufacture produces dioxin intentionally. It is an unwanted by-product of industrial/natural processes, especially those involving combustion, like a barrel of burning trash or a forest fire. On the bad side, since we cannot stop lighting setting forests on fire, like it or not, human beings have always been exposed to these compounds. Knowing that zero-exposure is impossible, considering its toxicity the EPA still decided to classify it as a "likely human carcinogen" and then set permissible environmental levels for dioxin (US EPA 2009). After EPA's regulation its total emissions have declined by 92 percent from 1987 levels.

Figure 5.6: US Dioxin Sources in 2004



Source: (DioxinFact.org 2005a)

There are several serious debates over dioxin's nature, its toxicity, its mode of action, etc. With limited time and space, I will not provide a systematic review on all these controversies. Instead, the dioxin case is used only as a preface to sketch the following section; that is, how dioxin has placed EPA in a dilemma between pursuing scientific accuracy and protecting the public.

Since everyone considers dioxin dangerous, as a regulator, the EPA has to decide what kind of danger it poses to the public. To this end, the distinction between carcinogen and non-carcinogen is crucial. After EPA established the Carcinogen Assessment Group in 1976 (Knox 1996; US EPA 2005), cancer and cancer-related research have received most attention. In short, the EPA makes an assumption that potential carcinogens can result in an increased risk of cancer no matter how small the dose is (non-threshold). This assumption is further based on the assumption that all cancers are caused by direct toxicity to DNA. Therefore, even a single molecule of a non-threshold substance can cause cancer (DioxinFact.org 2005a). Although it appears clear-cut, it is never easy to identify whether a chemical is carcinogen or not. The distinction between carcinogen and non-carcinogen largely lies in how data are

interpreted. Different interpretations sometimes yield completely disparate results.

Dioxin is of the most controversial, since scientists have not determined dioxin's actual mechanism in the human body to produce cancer. In some studies, it is assumed that dioxin causes cell mutations. Under this assumption, dioxin is treated as a carcinogen and accordingly a cancer model was built to explain it. Other studies, however, built their studies on a completely different assumption that dioxin precipitates abnormal cell growth; this growth then leads to cancer or promotes the development of cancer. Still others claim to have proved both models false. In these studies, dioxin is treated as a chemical or hormonal trigger that mediates between cells and causes abnormal growth. Therefore, the lion's share of dioxin debates revolves around whether dioxin directly "causes" or simply "encourages/triggers" cancers and whether it has a threshold quantity for the development of cancer (Knox 1996; Cole, Trichopoulos et al. 2003; Mackie, Liu et al. 2003; US EPA 2005).

Owing to these controversies, debates have begun to surface. Some attack EPA's intention to label dioxin a linear, non-threshold carcinogen (DioxinFact.org 2005a; 2005b). Others (Bullard 1994c; Tesh and Williams 1996) however ask the question: Is it really that important to get everything right? For them, no matter what the mechanism is, causing or encouraging cancer, cancer is cancer. Still others, especially the second- or third-wave scholars, attack the previous idea and query "is a total ban EJ's answer for everything?" Below is an outline on how dioxin has become an EJ case.

5.3.2.2.1 Dioxin as an injustice substance

According to the US Interagency Working Group on Dioxin, more than 95 percent of human exposure to dioxin originates from people's diet. Dioxin accumulates in the fatty tissues of meat and dairy food (DioxinFact.org 2005b). When these foods are consumed, dioxin then starts to accumulate in the human body. Given this exposure route, the most likely exposed people are those who consume large amounts of fish. Again, "fish" is the key word here. According to the *Equity report* minorities are

more likely to consume fish. For this reason, fish consumption is the intrinsic link between dioxin and EJ.

It should surprise no one that both government and EJ proponents appeal to the minorities to reduce fish consumption (Roe 2003; Taylor, Poston et al. 2006; O'Neill 2007). However, cutting fish consumption yields an unintended consequence: An increasing death rate from cardiovascular disease. Foreman Jr (2000:550) asserts this way:

> [S]caring consumers away from fish only makes sense in health terms if the replacement food does not prove even riskier.

Viewed in this light, a complete ban is not the answer. Trade-offs must be made, they argue. For example, some studies estimated that limiting salmon consumption can reduce approximately 50 cancer deaths; nonetheless, fish consumption can also prevent 30,000 cardiac deaths annually. In addition, it is argued that the benefits of fish consumption due to omega-3 were notably higher than the potential dioxin cancer risk (Tuomisto 2004; Leino, Tainio et al. 2008; Turunen, Verkasalo et al. 2008). Therefore, some commentators and groups urge EJ advocates to face the fact that "in the best interest of public health, and with limited public funds, it would be prudent to recognize this threshold, and regulate dioxin accordingly" (DioxinFact.org 2005b).

Facing the dilemma revolving around dioxin, as usual the EPA decides to regulate only "some" dioxins. The dioxins in land-applied sewage sludge are those *not* under the regulation. According to the EPA (2003c), what made them decide not to regulate dioxins in sewage is because the exposed population is ignorable. They estimate that the most highly exposed population are those who use sewage sludge to fertilise their crops or feed their animals. However, even in this population who consumes their own crops and animals over their entire lifetimes, only 0.003 extra cases of cancer could be expected each year. Therefore, the EPA concluded that dioxins from this source do not pose a significant risk to the public or the environment. This decision raises an EJ question: What if the EPA gets it wrong? More significantly, should we

gamble on people's health? To answer this, I now apply the dioxin case to explain the trade-offs between within scientific research.

5.3.2.2.2 The 95% rule: Making judgement between scientific accuracy and health protection

According to the Red Book (National Research Council 1983), the scientific grounds of observational, epidemiological or toxicological studies are based on data derived from observations of individuals or relatively small populations. Since only small populations are observed, in order to determine whether or not a link exists between a factor/substance and a disease, assessors have to introduce some general accepted statistical methods to help them make such decisions. The theory of hypothesis acceptance and rejection exemplifies the logic of scientific proof.

Consider for regulatory purposes whether dioxin causes a serious disease. Instead of directly testing the correlation between dioxin and the disease, the test always starts with a backward direction. A null hypothesis would be introduced and it will be set as: exposure to dioxin at certain dose is *not* associated with great incidence of a certain diseases. The aim for every study is to disprove this hypothesis. By so doing, then a researcher assures that this certain dose of dioxin is associated with such diseases. Before making any conclusion that a correlation exists, the process of a risk assessment demands a very high level of certainty to prove the null hypothesis wrong. By setting the certainty level high, scientists/assessors prove that their findings are not the result of chance.

To test this null hypothesis, scientists run the risk of false positive (type I errors) and false negative (type II errors) (Cranor 1990; Tesh 1993; 1997; Lemons, Shrader-Frechette et al. 1997). In the case of false positive, the study shows that the null hypothesis should be disproved, but in fact it is true (i.e. the null hypothesis should *not* be rejected). In the case of dioxin, although dioxin does not cause diseases, but the study falsely indicates it does. Likewise, false negative happens when the null hypothesis should be rejected, but the study mistakenly accepted it. Put differently,

while dioxin does cause diseases, the study wrongly shows that dioxin does not result in diseases. Statistical models offer estimates of the odds of committing such errors. Normally the probability of committing a type I error is designated α; the possibility of committing a type II error is designated β.

Table 5.4: Typology of errors

	Null hypothesis is actually true	Null hypothesis is actually false
	Dioxin is not associate with cancer	Dioxin is associated with cancer
Null hypothesis is accepted	**No Error** **1- α**	**Type 2 Error** **β**
Null hypothesis is rejected	**Type 1 Error** **α**	**No Error** **1- β**

Source: Dawn by the author.

Conventionally, researchers set α at 0.05, and the practice of setting α as 5% indicates that there is only a one in twenty chance of falsely rejecting the null hypothesis when it is in fact true. Put it the other way round, this 5 % value setting suggests that researchers want to be at least 95% certain that the null hypothesis is rejected correctly. Thus, the value setting of α is often called "the 95% rule" for the reason that the practice of having a 95% confidence level to prevent false positive. Regarding β, researchers are more flexible. Normally, it is set between .05 and .20. When setting β at .20, this practice of setting implies that researchers are willingly to take a 20% chance of conducting type II errors of saying dioxin is not associated with a disease but in fact it is. When β is set at .20, the power of a statistical test is .80 (1- β), which means researchers have an 80% chance of correctly rejecting the null hypothesis.

From setting the values of α and β one can easily identify that some value

judgements are hidden in the guise of science. Scientists/assessors tend to keep the value of α (the odds of false positive) low; in so doing, when a positive result occurs they can be more confident to claim that this positive result is not simply by chance alone. Conversely, if one use a higher value for α, say 20%, then it is more likely that the positive result is simply a result of random chance. As a result, such studies can add less to our understandings of this substance. Meanwhile, by setting the value of β at .20, it suggests that scientists could tolerate more false negative errors than that of false positive. In an EJ fashion, a higher value of β means scientists are willing to gamble public health with a 20% chance of committing false negative errors. That is, even though dioxin is in fact causing cancers, there is a one in five chance that an EJ assessment still suggests otherwise. The moral question is: Should we gamble on someone's health? Or, what is the right number (.05, .20, .25 or .50) for us to gamble? More specifically, is the 95% rule too high or too low?

For sure, the decision whether researcher commits himself/herself to the 95% rule is purely normative. It is largely dependent on one's mentality onto science. If one considers standards of proof important, he/she tends to hold α low; conversely, for those who consider science a means to ensure the most effective protection, they may loosen the 95% rule. In short, toward the 95% rule, some think this standard of proof is too high, others think it too low and still others think it is just right to protect both the public and minorities (Yang 1994; Montague 2004; Bridgen 2005).

Although not every EJ researcher explicitly suggests a most suitable standard of proof, we can still predict their positions from their arguments. For the third-wave hardliners, their position is the most manifest. As one may remember, these positivists repeat over and over again that "scientific standard" is key in both scientific study and policy. Since a 95% confidence level is something of a *minimum* standard for good statistical inference, to this camp departing from this rule is departing from science itself. Therefore, this camp's analysts are most likely to support the 95% rule.

For the second-wave camp, their attitude toward this rule is less clear. Yet, it is very

likely that they will also support the 95% rule but for a purely economic reason. To them, the current precautionary point is simply too expensive to achieve. Meanwhile, the regulators often ignore the risks that their own regulations cause. Concretely, this camp believes that the standard practice of risk assessment, including the 95% rule, is too conservative already. A conservative system like this is in itself inclined to be on the side of caution and safety. It is however very costly. When the cost of regulations is high already, it would be a mistake to further lower the scientific standard, which makes the current system cost even more. For instance, the maximally exposed individual[75] (MEI) is widely adopted in risk assessments to ensure that almost no one could be more exposed to a certain dose. However, as analysts have contended, since such hypothetical individuals do not exist in the real world, this MEI model accordingly cannot reflect the actual exposure in any way. By assuming a relatively high degree of exposure, the worst, not the expected/actual, scenario is addressed in current EJ assessments (Applegate 1997; Cross 1998). If assessors have a tendency to deliberately and systematically exaggerate the extent of risks in the name of precaution already, policymakers should not further compromise the 95% rule to an even lower point.

Moreover, as noted, both the second-wave neo-liberalists and the third-wave positivists have long urged us to face the repercussions of this conservative position. To loose the current protection standard, i.e. 95% rule, means that more budgets will be spent on EJ, even though there is no sufficient evidence to prove that EJ risks exist. In that case, spending too much money on environmental regulations can in fact do more harm than good, as more innocent people may die elsewhere owing to these unwarranted regulations. Critics even coin a term, statistical murder (Graham 1995a), to describe how serious it is if we spend all the money on these regulations. Without sufficient money left for other equally important things, the most vulnerable may suffer *more* from the EJ policy that should be designed to protect them (Cross 1995).

Finally, from the viewpoint of the first wave (Tesh 1993; Tesh and Williams 1996),

[75] More information can be found in the next section.

choosing 95% rule demonstrates nothing but a permeated mentality that scientific accuracy trumps anything else. Under this scientific mindset, even public health is considered secondary. To this camp, it is asserted that the current 95% rule reflects an implicit assumption that disposing is generally acceptable and our environment is polluted already. Following this assumption, epidemiologists further presume that unexposed and unharmed populations do not exist. Therefore, proof is always demanded before actions are taken. All these indicate a common thinking among scientists: Innocent until proven guilty. For this reason, a high level of certainty is demanded before making any changes. EJ advocates condemn the 95% rule for its implication that risking the public health is preferable to risking the economic growth. Further, this camp asserted that the status quo is maintained under the guise of scientific neutrality and scientific justification. Definitive scientific answers are needed before making any changes, even though the justification is almost impossible to make.

To achieving EJ, the first-wave camp argues that departing from the current 95% rule is necessary and abandoning 95% rule is only the first step. In some cases, it is reasonable, some argue, to loosen the confidence level to as low as 50% (more accurately the level should be either 49% or 51%) (Tesh 1993; Tesh and Williams 1996). With $\alpha = .51$, it suggests that there is now a 51 percent probability of mistaking a benign substance for a toxic substance. However, under this EJ scheme, as long as scientists/regulators demonstrate that a given substance is “more likely than not” to be toxic, actions should be taken to regulate it. One seminal US Supreme Court decision concerning benzene reflects this standpoint:

> The burden was on OSHA [the Occupational Safety and Health Administration] to show, on the basis of substantial evidence, that it is at least more likely than not that long-term exposure to 10 ppm of benzene presents a significant risk of material health impairment. Here, OSHA did not even attempt to carry such burden of proof. Imposing such a burden on OSHA will not strip it of its ability to regulate carcinogens, nor will it require it to wait for deaths to occur before taking any action. The requirement that a "significant" risk be identified is not a mathematical straitjacket; OSHA is not required to support its finding that a significant risk exists with anything approaching scientific certainty; and the record in this case and OSHA's own rulings on other carcinogens indicate that there are a number of ways in

> which OSHA can make a rational judgment about the relative significance of the risks associated with exposure to a particular carcinogen.[76]

At first blush, it might seem to be admirably protective of public health. However, looking closer, one may notice that now our false positive rate is no better than a flip of a fair coin. Even so, some EJ hardliners (Montague 1995) still insist that it is the right way to go. Surely, they argue, when the statistical strength weakens, scientists/regulators are less sure about the accuracy of their findings. Nonetheless, by using a 50% confidence level, the public can finally assure that scientists and the EPA are putting public health *before* scientific accuracy. For them, the fundamental question is: When science is uncertain, should scientists or policy-makers risk people's life? To this question, their answer is always "no". It is believed that those who stick to the 95% rule are somehow on the side of *injustice* because their choice implies that they weight science more than people's health. One of the most oft-cited examples is perhaps the Love Canal case.

5.3.2.3 The Love Canal case: Who knows EJ best?

Under the 95% rule, most EJ communities are simply too small to demonstrate any statistically significant results even though a site or a substance poses a tremendous danger to the locals. Love Canal is one of its kind. In the early 20th century, the Hooker Chemical (later Occidental) company decided to bury a huge amount of toxic wastes in a ditch in Love Canal, near Niagara Falls, NY. The company later sold the site to the city government for one dollar. People then started to build houses near the centre of this hazardous waste site.

In the mid 1970s, the locals started to notice the chemical odours and ooze. It is estimated that around 21,000 tons of chemicals were dumped in the abandoned canal between 1947 and 1952. Until the catastrophe finally discovered in 1977, residents in Love Canal had been literally "living" with the toxic for decades. Even though some of the residents got sick, researchers failed to determine the causation of injures.

[76] American Petroleum Institute v. Industrial Union Department, 448 U.S. 607 (1980). at 610.

According to the EPA, although some studies did confirm the link between low birth weight and the routes of underground water flow, these studies however could not reach a consensus on the mechanisms of exposure. As a result, the EPA conclude that what harms have been done to residents remains unclear (US EPA 1979; 2000).

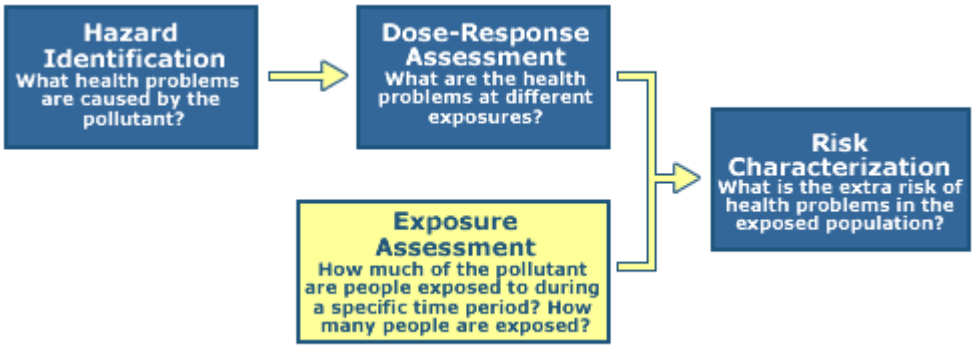
How can it possible that a case like this is no one's fault? Some activists outcry: "The evidence is in my body!" (Collins and Cox 1976:311 ff; see also Checker 2007). It is understandable that EJ supporters are keen to identify the culprit (Lercher 2004). However, perhaps the question should not be "which polluting acts are blameworthy" as that they have asked. A more suitable question should be, "what has been cloaked under the name of science/scientific evidence?" With a population as small as 3000 to 6000 people (dependent on how we measure it), scientists are struggling to make any link between the buried chemicals and the illnesses among residents (Gensburg, Pantea et al. 2009). Take the maximum estimated population, 6000 people, as an example. If the chemicals cause one extra cancer case in every 10,000 people, the estimate excess case of cancer should be around 0.6 people in the case of Love Canal. Considering that cancers account for 20%-30% of total deaths annually (the background rate), one does not have to be an expert to know the result of such studies: 0.6 excess deaths are not statistically significant; therefore, any conclusion on causation is inconclusive as well.

With a totally different attitude toward EJ and science, one should have no difficulty to understand why EJ critics argue that although the above outcry sounds very convincing, they are by no means persuaded. As mentioned, the second wave contenders assert that the suggestion of loosening the 95% rule indeed cannot and will not bring justice; rather, it will only cause more injustice because these EJ regulations kill (Cross 1995). It is especially the case when a regulation is based on a 50-50 probability which is no better than the flip of a fair coin. If public funds are directed by a 50-50 probability, people elsewhere, including minorities, will definitely die because of these ungrounded regulations. While it seems an endless debate, one thing is for sure: The selection of confidence levels is a value judgement, not a value-free science.

5.3.3 Exposure Analysis:

5.3.3.1 Who exposes to what, when, and how much?

Figure 5.7: The third step in risk assessment process



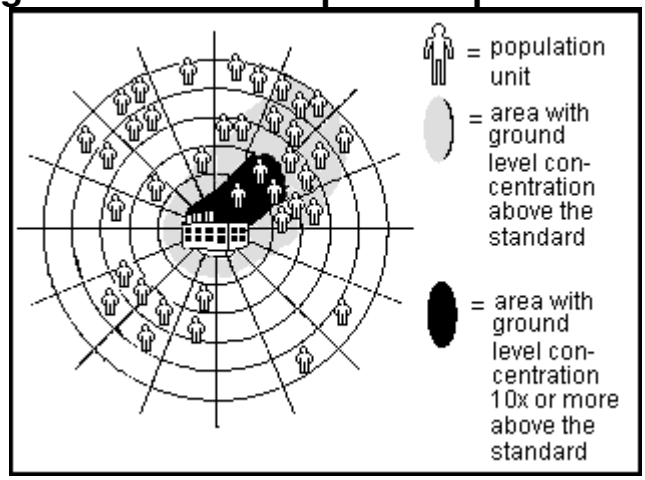
Source: (US EPA 2008c)

The exposure assessment moves the process from the laboratory study of how target populations respond to a certain chemical substance, to the task of determining how given populations expose to this chemical in the real world. According to the EPA, exposure is defined as "contact between an agent and the visible exterior of a person (e.g. skin and openings into the body)" (US EPA 2008c;brackets in origin). In this phase of assessment, as one can see, two questions have been asked: How much of the pollutant are people exposed to during a time period? How many people are exposed? To answer these, the EPA has to measure (or estimate) the number of the potentially exposed people, and the amount of exposure to the given substance (Patton 1993).

As the EPA admitted itself, although in theory exposure can be directly measured, in reality it is indirectly estimated through statistical models because a measure like this relies on many kinds of information, which is however not always available. Since exposure levels are mathematically modelled and predicted, rather than actually measured, it necessarily involves generalisation and thus there is a great deal of uncertainty about the meaning of EPA's final estimate. For example, two sets of

information are key in quantifying exposure: Firstly, the magnitude (how much), frequency (how often), and duration (how long) of current/future human exposure to an agent in the environment; secondly, the size, nature, and types of human populations exposed to the agent (US EPA 1992e). When all data are in, theoretically analysts should be able to characterise exposure and then illustrate an "exposure map" corresponding to its exposure levels.

Figure 5.8: An example of exposure map



Source: (US EPA 2008c)

From the above exposure map, as we can see, some individuals are located in the hot-spot (dark) area and therefore these people are exposed to a higher degree of contact. By contrast, those in the clean-zone (white) area have no exposure whatsoever, even though the factory is literally "in their backyards". There are at least two points of contact between EJ and exposure analysis. Firstly, as mentioned in the previous chapter, impact circles are deemed to be an improved technique which can be used in tackling the scale problems (MAUP). Yet, as the exposure map has demonstrated, the impacts circle technique is by no means an accurate proxy for exposure, since it is highly possible that people located in the same concentric circle are exposed to different amount of pollutant. In brief, the so-called "improved" technique is somehow flawed for the reason that it cannot truthfully reflect the actual exposure/risk from a facility. If that is the case, none of the spatial EJ studies, as third wave scholars have argued, is reliable enough to be used in decision-making systems.

Secondly, probably also more importantly, if analysts can demarcate the exact range of impact areas, it raises the question of whether it is justifiable to further distinguish residents in accordance with their social traits within the impact area. Take the above exposure map. As one can see, there are three people in the dark zone (heavily polluted area). Suppose two of them are Blacks; the other is White; and all three of them, according to the map, are at risk[77]. If the ultimate goal of environmental protection is to protect "everyone" at risk, it seems less meaningful to further differentiate between Black and White residents, who have equally suffered from the facility. Then why bother wasting money on a risk-based EJ analysis? Evidently, the above exposure map demonstrates a conflict between the goal of environmental/equal protection and that of EJ (protecting the minorities). As Padgett and Imani's study (1999) has revealed, most local environmental protection officers suggest that protection should be *equally* practised on everyone at risk. To them, equal protection itself is "EJ". To this end, it is considered mistaken to neglect White citizens in danger on the basis of their "Whiteness". This debate poses a fundamental question to EJ: Should environmental protection ever be driven by justice? To some, it should be driven by the actual risk/danger (Cross 1995; 1998).

Apparently, most EJ advocates support the idea that regulators take social traits into consideration to balance the problem of generalising exposure. EPA's *Equity Report* showed just that:

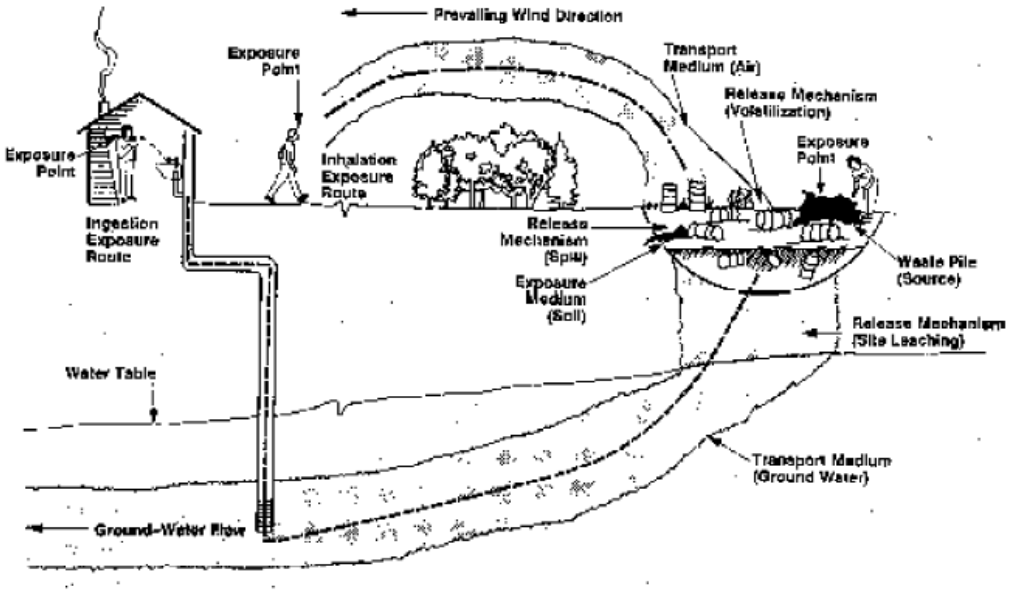
> [D]emographic categories may be useful markers for identifying population subgroups that have some likelihood of experiencing exposures significantly different from the average exposure and, thereby, possibly different health risks from the average population. (US EPA 1992a:34)

To take a step further, if all parties agree that social traits should be given careful consideration, it begs another question: Is it possible to take every single trait into consideration? To this question the answer seems to be "no". Given enough creativity,

[77] It is worth noting that in a site-wise study, it is easier to combine an exposure map (risk assessment techniques) with its demographics (spatial/demographic data). However, it is not always practical to do so in a large-scale study. As seen in the previous chapter, a nation-wide study normally depends on census data, meaning that, researchers only *estimate* the demographic make-up of the target area, rather than collecting these data in person. Thus, if one combines risk assessment with spatial research on a large-scale, one can no longer know for sure who exactly is at risk.

one can have an endless list for these traits. Suppose we do have such a list. It is still impractical to conduct an exposure analysis accordingly. That is because, although exposure analysis is very information intensive, unfortunately none of this information is readily available. In a typical case of risk analysis, it is extremely hard to know every detail and get data ready beforehand. For instance, one may know that there is a LULU in someone's backyard. We however may still have no idea what pollutants have been discharged, their concentration at the source, their pathways (air, water, food etc.) from the source to the population being contacted, and the actual levels these pollutants damaging target organisms. With so many known unknowns, these uncertainties and gaps are not easy to bridge. In a word, most analyses are made when most data are *not* in.

Figure 5.9: Some potential exposure pathways



Source: (US EPA 1989:6-9)

If the above view is correct, it seems that the risk/exposure analysis is indeed an obstacle rather than a help for the EJ movement. As some commentators have revealed already (Cranor 1988; Lemons, Shrader-Frechette et al. 1997), the current procedures in risk assessments tend to pursue, almost unnecessarily, the highest standards of scientific accuracy. Under this thinking, changes cannot be made until

full evidence for changing is provided. Consequently, if we adopt such a system then the status quo will be maintained. From this angle, it is argued that the third wave tenet, "doing nothing until all data are in", is indeed a twist in the plot of de-regulation. De-regulation and the status quo will then further cause under-protection. In this light, exposure analysis poses a serious dilemma for the EJ movement. Once EJ advocates start to talk like risk regulators and use terms like "riskscape" (Morello-Frosch, Pastor et al. 2001; Abel 2008), they are expected to answer the above-mentioned questions which they do not always have the ability to answer. Therefore, before the present risks analysis system itself has been changed, the best strategy for EJ seems to be that activists should avoid being dragged into the debates on risk since the current system is notoriously slow and costly. However, if they distance themselves from the debate, their critics will accuse them of anti-science (Cross 1995; 1998; Foreman Jr 2000). Several EJ cases bring this point to light. I shall now turn to these cases.

5.3.3.2 Pica behaviour: Do children really eat dust in the playground?

In current risk assessment practice, exposure assessment is perhaps the most relevant to the EJ concerns, since this is the step that assessors identify the amount of a chemical substance that actually reach the target population from a pollution source. In theory, as indicated above, the more the attainable pollution that reaches the target population, the greater the risks are. The problem is, since exposure assessment is very greatly depending on the type of the pollution source and the method in classifying varying target populations, its process is far more difficult and controversial than one thought. For example, if one chooses children as the research target, then critics may inquiry: How about single mothers, the elderly, infants etc? Before further developing this question over demarcation, I firstly focus on EPA's assumptions over children's behaviours. From this specific case, one can see that EPA's exposure assessment is based on a series of surreal or even counterfactual assumptions.

According to the EPA, in places where the sites are accessible it is highly possible for

children to enter, explore, or play on these sites. When playing on the contaminated site, they often incidentally intake the polluted dust from normal hand to mouth contact. Moreover, toddlers may also "intentionally" eat the dirt from the industrial sites, said the EPA. This dust-eating behaviour is called "pica behaviour" (US EPA 1988:10). Considering the possibility that children may contact, inhale, or intake dust/dirt, it is argued that the EPA should systematically take children's behaviour of exposure into consideration (US EPA 1988; US EPA 1989). Echoing this suggestion, EPA conducts a series of research to address this issue. One of its kind is EPA's special handbook on children's behaviour and their exposure (US EPA 2006). Here, the major contention is: Whether or not EPA's model reflects the actual behaviour of children? The following examples illustrate how the pica issue operates in practice.

Table 5.5: Typical daily soil ingestion rate for children by age group

Age	(mg/day)
0-9 months	0
9-18 months	50
1.5 - 3.5 years	200
3.5 - 5 years	50
5 - 18 years	10

Source: (US EPA 1988:128)

In its research on contaminated soil exposure, the EPA assumes that "pica" children eat about two teaspoons of dust from the site *everyday* for several years. Also, it is estimated that when playing in a site they may dig up a several-feet hole to reach the most polluted hot spot in the site (Breyer 1993:12; Shere 1995:465-467). When these pica toddlers grow up, they may eat less dirt (see the table above); they however are still exposed to higher risks than other aging groups. In a Superfund site research (US EPA 1989:6-43), the EPA "guesses" that these children visit the sites 3 times a week in fall and spring (>32˚F); in summer days, they wander around the sites 5 times a week because they do not have to attend school. These naughty children's strange behaviour does not stop there. In an incinerator assessment, the EPA further assumes

that they drink dirty water and eat the caught fish from a contaminated pond:

> [Children] ate about two teaspoons of dirt each day,…ate fish from a pond near the incinerator, his fish consumption was at the ninety-fifth percentile level, he drank contaminated water from the pond, he ate food grown primarily from the family garden, and he drank milk from a cow which grazed on [nearby] forage….(cited in Shere 1995:466)

This may not seem altogether unreasonable until one starts asking: Do children ever eat any dirt on a swampy site? (Breyer 1993:12) Surrounding the issue, all parties are gathering. Although most people agree that EPA's pica assessment is surreal and counterfactual, their interpretations toward these unrealistic assumptions are quite different. For EJ proponents, it is true that EPA exaggerates children's behaviour. However, better safe than sorry, they argue (Perkins 1991; Weintraub 1997). On the other side, its opponents argue that a surreal research like this is simply a waste of public money (Breyer 1993; Shere 1995). Ironically, it is the EJ contenders who tend to assert that no children are as stupid as to eat dirt from the site; conversely, EJ supporters insist that sometimes children do eat dust.

After seeing the pica case, one may think that because children's behaviours are by nature hard to predict, it is somewhat understandable why EPA chooses these impressionistic assumptions. In the case of adults, one may consider, the aforementioned uncertainty and malleability can be eliminated, or at least to be decreased to a negligible degree. I now turn to the adult case to see whether we know more about adults' behaviour.

5.3.3.3 Maximum individual risk: A person who stands outside 24 hours a day, 365 days a year for 70 years

Unfortunately, assumptions incorporated in the adults' models are similar in kind to those in children's model. Take the study of pesticide. As one may remember pesticide is an EJ hot spot, since EPA's own research concluded that minorities, especially Hispanics, are more likely to expose to pesticides (US EPA 1992a; 1992b). In order to estimate the exposure rate for a target group, a series of research has been

conducted. Due to the absence of hard data, the EPA decides to play safe. In so doing, it is assumed that every farmer who grows a specific crop will use "all registered pesticides" for a given crop. Also, the EPA assumes that no degradation of the pesticide takes place through weather, time, peeling, and washing. That is, the level of pesticide on the dinner plate is assumed as same as that in the field. Overall, carcinogenic pesticides are assumed to reach its maximum allowable concentrations on every treated crop (Rosenthal, Gray et al. 1992:300). However, one does not have to be an expert to know that this maximised assumption is unrealistic.

EPA's exposure assessment for air pollutions shares similar assumptions with the pesticide case. The agency uses mathematical wind dispersion models to simulate air emissions. As scientific as it may sound, this assessment is however based on the assumption that a person stands outside 24 hours a day, 365 days a year, and he/she will keep standing outside for 70 years. Again, even a lay-person can swiftly indicate how unrealistic this assessment is; yet, these assumptions are indeed serving a significant role in reflecting predetermined policy position:

> Although no one spends his or her entire life outdoors at the fenceline of the factory, and although few factories produce the same products, or even exist, for seventy years, the MEI [Maximally exposed individual] calculation is designed to be conservative. By overstating probable actual exposure, it provides a safety margin, giving an upper bound on the true lifetime exposure.(Rosenthal, Gray et al. 1992:291)

For EJ hardliners (Morello-Frosch, Pastor Jr et al. 2002; Lambert, Soskolne et al. 2003), it is argued that everyone knows this most-exposed-individual scenario is an exercise in pure fiction; however, under the banner of "precautionary principle", it is always believed to be best to err on the side of safety. Conversely, from the standpoint of the industry and its advisers (mainly those from the second- or third-wave camps) this scenario can do no good but harm. To them, MEI is mistakenly aiming at an unachievable target, which only paralyses the regulation itself (Cross 1992; 1996; Foreman Jr 2003).

5.3.3.4 I care about the children, but how about women, single parents, the elderly, etc?

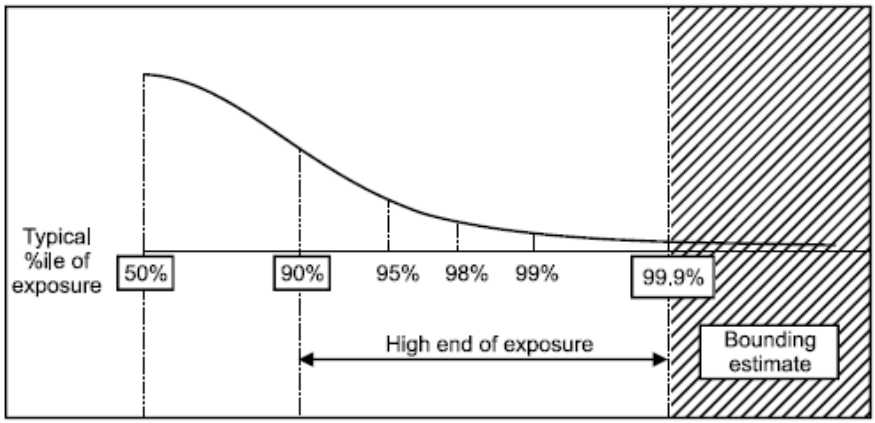
Ironically, both sides are not satisfied with the current system. The first wave adherents accentuate that EPA's assessments can never reach a conclusively or comprehensively understanding on every sub-population. For this reason, it is claimed that more resources should be directed into studies over the "forgotten casualties", like women, single mothers, infants, children, the elderly, and so on (Cutter 1995; Weintraub 1997; Pastor Jr, Sadd et al. 2002; 2004). This list can be further stretched until it becomes infinite. Such infinite list, of course, begs the question of where to stop (Epstein 2004; 2007:Ch 10). Toward this question, this camp seems to suggest that we should never stop stretching the list, "because the best policy is always to avoid unnecessary exposures and periodically to review all exposures with an eye toward eliminating and/or reducing exposures to the lowest level that is feasible." (Montague 2004:745)

Predictably, this unlimited list is not fully appreciated by its opponents. As the third wave supporters contend, minorities are facing a series of problems. If poor health is the major concern among minority communities, then a "justice" policy should target at improving the health of minorities. Simply labelling an issue as an EJ concern cannot serve the end of health protection. From this perspective, if problems are defined in fairly narrow EJ terms, EJ then becomes a thing that has little real relevance to the public/minority's "good" (Foreman Jr 2003). The result is that, risk/risk assessment will lose its real meaning but be treated as a political tool. To these contenders, the very concept of EJ has put the public health in danger; justice will never be attained through this way, they argue.

Sometimes, these arguments were taken even further. On the one hand, critics hotly dispute EPA's unrealistic policy. In order to include at least 95 to 99 percent of the population, the EPA deliberately exaggerates and distorts the extent of the risk so that the results of its exposure assessment can represent the "worst case scenario" (Applegate 1997:267). Such a scenario, they argue, can never be a normal one. In this respect, it is believed that if these unrealistic assumptions are dropped, the

estimated exposure rates become “millions of times smaller” than the mid-range estimates of risk on basis of the worst case assumptions (Shere 1995:466). The public, they stressed, should be freed from the reign of the meaningless numbers and the unchecked scenarios. For this reason, some institutions, like Occupational Safety and Health Administration (OSHA), are praised as they insisted that their administration were required to produce “realistic” estimates of risk, rather than providing the worst case estimates (Yang 1994:551).

Figure 5.10: Schematic of exposure estimators for population distributions



Source: (US EPA 1992e:85)

On the other hand, suppose MEI is somehow preferable and justifiable, a MEI-based assessment may still be unworthy of serious consideration. Given that the public in general and the EJ advocates in specific remain sceptical about this already overprotective method, why should the industry continue practicing such an assessment that no one trusts? In an EJ symposium, an industrial representative pointed the mistrust among industry and residents. An example was given to illustrate such mistrust.

A typical risk controversy begins when some residents complain that a project is dangerous or injustice; the authorities or the company, thereby, investigates the hazard. In order to gain people’s trust, MEI is often adopted in such an investigation.

In this industry-initiated assessment, exposure is defined as someone who lives/works in a ten mile radius of the facility 24 hours a day all over his/her life for the entire 20 year operational life of the incinerator. Since people rarely stay in a ten mile radius circle for all their lives, the industry believed that it had done its best to protect the locals. According to this study, their incinerator project only causes 3 additional cancer cases in every 100,000,000 ($3x10^{-8}$). Given that one in three of Americans will contract some kind of cancer in their lifetime (about 33,000,000 cases in 100,000,000 people), it is argued that the risk from this incinerator is extremely small. In addition, since there were only 1400 residents in the host community, the health risk for them is almost as low as negligible (McDermott 1994:700-701).

Unsurprisingly, the locals did not respond well to this study; they remained dubious about the findings. It turned out that the industry ends up investing a large amount of money on a useless piece of risk assessment. This industry paper then concluded that the mistrust results from the gap between perceived fears and actual risk. Some formulate (Sandman 1993) this sharp distinction as "risk = hazard + outrage". In order to bridge this gap, they argue, effectively informing and educating the locals are fatal. The implications behind this equation are more than clear: You may get your hazard right (a risk of $3x10^{-8}$); nonetheless, until you do something to the outrage part, the industry can never persuade the public that hazard is low.

Under this thinking, the third wave condemns EJ's lack of sincere interest in the issue of risk. To them, if EJ proponents care about risk sincerely, risk assessment deserves our continued support. However, if EJ's goal is somewhere else, then all the money investing into risk assessment is simply a waste, because EJ activists has decided not to trust any findings from the outset. If that is the case, why bother spending so much money on the untrustworthy risk assessment? (Foreman Jr 2003)

5.3.3.5 Risk avoidance: Your pica child, your responsibility!

Echoing the above industrial complaint, under the Bush administration, it was

claimed that risk reduction is too costly; so a turn to risk avoidance is demanded. Traditional risk reduction strategies aim to limit emissions, to clean-up contaminated sites, or to prevent pollution in the first place. Risk avoidance strategies, by contrast, require the locals exposing to contaminators change their lifestyles, thereby "avoiding" the risk (O'Neill 2003; 2005). To illustrate this point, we can take children's pica behaviour as an example. Instead of conducting an unreliable risk assessment on their dust intake, a risk avoidance based policy asks the parents to prevent their children from eating dust. By so doing, it is argued that risk avoidance can provide the same amount of health protection as risk reduction. What is more, risk avoidance's supporters argue that this concept is a much more "just" way to use public money since it seems unjustifiable to ask the government to take parents' responsibility. In a word, it is your pica child; therefore it is your responsibility as well.

The premise of risk avoidance has shaken EJ to its very roots. As addressed in Executive Order 12898, fish consumption is a major EJ concern among minorities. A huge body of literature has revealed that there is a disproportionate health impact generated from minorities' fish consumption (Mott 1995; Harris and Harper 1997; Chess, Burger et al. 2005). In order to protect minorities from eating a large amount of contaminated fish, EJ promoters seek to fully limit mercury emissions from coal-fired power plants. Obviously, this is a strategy of risk reduction.

By adopting the premise of risk avoidance, EPA's new regulation turns the EJ argument on its head. Under its new regulations, the most affected are asked to keep away from fish diets. Likewise, other authorities also made a shift on their site clean-up procedure from risk reduction to risk avoidance. In the first step, these agencies alter their clean-up baseline and allow a higher amount of pollution to remain at a site. They then introduce a stricter regulation to restrict future uses of this site. Concretely, under the banner of risk avoidance these agencies no longer "clean-up" these sites. What they do now is to use institutional controls, like fences, warning signs, and zoning, to limit people's contact with the pollutants left in places (O'Neill 2005). By shifting the burdens from polluters to the victims, these new rules not only

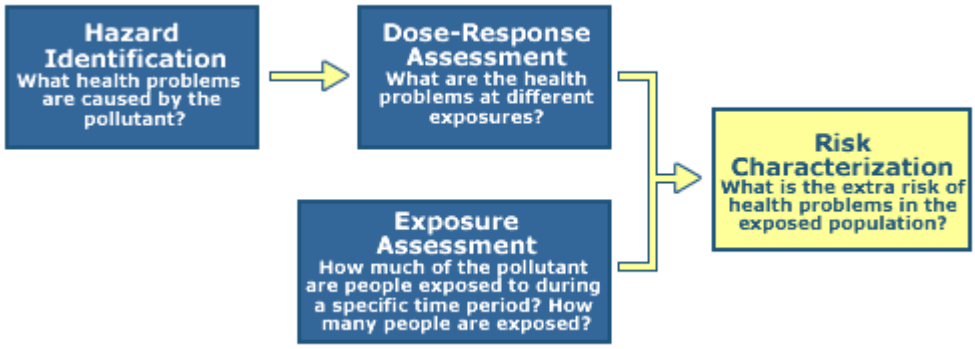
loosen the baseline of exposure assessment but also shift the meaning of EJ. Now, it is the most affected who have the responsibility to avoid risks. Again, it is your health so that it is your responsibility as well.

5.3.4 Risk Characterisation

5.3.4.1 What is hidden in a number?

Being the structure of this four-part process, our final step in risk assessment is called risk characterisation where the extra risk of health problems in the exposed populations will be determined. As the final step, the assessors will integrate all the data from the previous dose-response and exposure stages into a quantified risk probability. To do so, the harm from each unit-dose estimated in the stage of dose-response assessment is multiplied by the total doses that predicted in the exposure analysis to get a quantified number.

Figure 5.11: The fourth step in risk assessment process



Source: (US EPA 2008d)

Although risk characterisation is most commonly understood as simply the multiplication of the numbers from the dose-response and exposure assessment stages (Exposure X Hazard) (Israel 1994; Shere 1995), EPA insists that its risk assessors have done more than simply multiplying numbers. According to the EPA, before making an integrative final risk characterisation, in practice their assessors are supposed to provide an individual characterisation in each of the previous stages to

reveal the key findings, assumptions, limitations, and uncertainties beforehand. In this light, the overall risk characterisation comprises the individual risk characterising and one integral analysis. These sets of individual characterisations are the information foundation for the risk managers to make decisions. With these scientific bases, the EPA can easily justify its regulatory standard accordingly. In brief, in the final stage of the assessment the EPA assessors are obliged to clarify and explicate all inherent uncertainties and assumptions in the results. For this reason, the EPA emphasises that its final results are more than a number (Patton 1993; US EPA 2008d).

Although the EPA describes its assessments as more than a mathematical technique, it remains unclear about at what risk level the potential effects of facility are expected to be safe. Specifically, when setting a national standard, the safe level is usually stated as a bare number (i.e. a risk of 10^{-6}). Regarding this number, a series of debates arise: Is a risk of 10^{-6} too high or too low? Is this number of 10^{-6} defensible? More fundamentally, how safe is safe enough?

5.3.4.2 Rush to the bottom

One can easily foresee that researchers are in severe disagreement about the number-setting. Similar to other agencies, the EPA asserts its acceptability of risk as 10^{-6} below which regulation is not needed. Even the EPA itself admits that this single risk control point (1×10^{-6}) implies an unrealistic degree of scientific precision.

> Risk estimates are commonly expressed as probabilities: for example, 1 in 100,000 (1×10^{-5}) or 1 in 1 million (1×10^{-6}). Such an estimate does not represent the actual risk. Actual risk may, in fact, be lower, even as low as zero. Further, unless otherwise stated, EPA's risk estimates are life time cancer risks. (cited in Babich 2003:150)

Owing to this unrealistic control point, the general rule of 10^{-6} has been bent from time to time. In order to set a reasonable regulatory level, an acceptable "range" was introduced to replace the alleged expensive and impractical control "point" (Burmaster and Harris 1993; Mank 1994; US EPA 1997). For instance, in the context

of the Superfund programme (US EPA 1997b), the EPA set the range between 10^{-6} and 10^{-4}. It then cautioned that 10^{-6} should still be used as the starting point for analysis. As if a single risk target were not uncertain enough, this acceptable range soon provokes severe criticism. Now both ends of the range are open to criticism. Some commentators insist on a "single and nationwide" risk target to ensure a consistent level of protection (Babich 2003). This clear and rigid target, it is believed, could close the unnecessary manipulative room for the EPA (Belluck and Benjamin 1990:281; Mank 1994). The concerns from EJ advocates are not groundless, since EPA did attempt to further loosen its regulatory criteria.

By setting the lower-boundary of the risk range at 10^{-4}, the EPA further created a "presumptive safe level" in the control of air pollution (US EPA 1997b:(attachment B) 3). This makes its regulation even laxer. Its effort at de-regulation did not stop there. After successfully adjusting the risk criteria downward to 10^{-4}, EPA began to assert that in some Superfund sites a $3x10^{-4}$ risk (1/3333) is, in fact, "essentially equivalent to the presumptive safe level" ($1x10^{-4}$ or 1/10,000) (US EPA 1997:(attachment B) 3). Again, it does not take long for anyone to notice the problem of this assertion: How could it possible that both $3x10^{-4}$ and $1x10^{-4}$ are providing an equal level of protection? After all, in comparison with a $1x10^{-4}$ risk, the risk level is tripled in $3x10^{-4}$. Then the flood gate opened. People now ask for further lowering of the criteria. They argue, if $3x10^{-4}$ can provide "essentially equivalent" protection as $1x10^{-4}$ does, there is a possibility that $9x10^{-4}$ (1/1111) could also provide equivalent protection as $3x10^{-4}$ could provide. If that is the case, then a $9x10^{-4}$ risk should be "presumptive safe" as well (Babich 2003:153-154). This trend of changing the safe level later became a rush to the bottom. In the case of nuclear regulation, the US Nuclear Regulatory Commission and US Department of Energy have lowered the risk level to as far as a $2x10^{-3}$ risk (1/500) (Babich 2003:154).

For most EJ promoters, a control point lower than 10^{-6} is regarded too weak; however, for others, especially for the second wave neo-liberalists, these risk criteria may tell us the other side of the story. If a $2x10^{-3}$ risk can be qualified as safe in the most controversial case of radioactive risks, why does EPA waste so many resources in

chasing the unrealistic goal of 10^{-6}? Again, it is argued that when a regulation is chasing an unreachable goal, people will die elsewhere because of this unrealistic regulation (Cross 1995).

5.3.4.3 The best way to address EJ is to abandon it?

No matter which number is chosen, the chosen control point begs a question of what it really means. The EPA urges us to be cautious because the number itself does not, and cannot, tell to whole story:

> [E]ven though the numbers are identical, a cancer risk value of 10^{-6} for the "average exposed person" (perhaps someone exposed through the food supply) is not the same thing as a cancer risk of 10^{-6} for a "most exposed individuals" (perhaps someone exposed from living or working in a highly contaminated area). (Patton 1993; brackets and quotation marks in origin)

In a word, no matter how low the risk is, most exposed individuals are still facing more risk than others. Evidently EPA has acknowledged the fact that even after its regulation some subgroups are still susceptible. Nonetheless, it is mistaken to assume that EPA admits its assessment procedure is systematically discriminating these subgroups:

> Environmental and health data are not routinely collected and analyzed by income and race. Nor are data routinely collected on health risks posed by multiple industrial facilities, cumulative and synergistic effects, or multiple and different pathways of exposure. Risk assessment and risk management procedures are not in themselves biased against certain income or racial groups. However, risk assessment and risk management procedures can be improved to better take into account equity considerations. (US EPA 1992d)

In other words, EJ critics may contend that the data in this final stage incorporates the already flawed data from the prior stages. There is, however, no evidence to demonstrate that the whole risk assessment system is somehow racially charged. Here comes a new source of contention: If the risk assessment is not biased against some subgroups in itself, how to better address equity in the current system? Toward

this issue, John Graham (Graham and Richardson 1995; Tengs, Adams et al. 1995; Graham 1995a; 1995b; Graham, Beaulieu et al. 1999; Perdue, Stone et al. 2003), later the Administrator of Management and Budget in the Bush administration, may be the most powerful but also the most controversial figure.

Graham wrote quite a few articles on EJ. Among these pieces, the most controversial one is perhaps his research over "how to save 60,000 lives a year" (Graham 1995a; critiques see Heinzerling 2002). In this article, he argued that by allocating our limited resources more wisely, we could save 60,000 lives a year. He adopted a rather straightforward strategy to prove his points. Firstly, he investigated 500 governmental programs regarding health and safe control. He then identified those programmes that simply do not work. Finally, he calculated how much we can save if we stop wasting our time and money on these unworkable projects.

This research is extremely important for the reason that quite a few EJ subjects are included in his list of the unworkable. For example, he suggested that we should stop further reducing the already minute amounts of *pesticides* in foods. Also, he believed that we should stop being obsessed over radiation exposure from *nuclear* waste storages and power plants. In his opinion, huge amounts of money are poured into projects which eliminate trivial risks to health and safety. However, the only reason these trivial risks are chosen is because people fears that these synthetic chemicals and radiations may cause "cancer" (Graham and Wiener 1995; Graham 1995a). To him, these fears are baseless. What generates public outrage, he argued, is not the magnitude and probability of the risks, but the perception of these risks. Take the EJ case of air pollution. Research has shown that indoor pollution is far more risky than outdoor pollution. Given that most people spend more than 90 percent of their time indoors, indoor pollution level can be 25 times, sometime 100 times, higher than they are outdoors. Nevertheless, most EJ research is focusing on people's outdoor risk. As other third wave scholars (Foreman Jr 2000) and risk analysts (Slovic 1986; Morgan, Florig et al. 2000) also highlighted, it seems indefensible that EJ spends all the money on outdoor air quality but neglect indoor pollution altogether.

While most EJ critiques lay emphasis on the fault that current risk assessment process fails to protect the most vulnerable, risk analysts however reproach the current system for its systematic "over-protection". How to explain the number has therefore become a subject which invites heated debate among EJ scholars. EJ contenders urge us to face the fact that although the risk of 10^{-6} is real, this risk level is simply too small to worry. To prove how low the risk of 10^{-6} is, analysts use aeroplane clash as an example. They argue that the control point of 10^{-6} is less than one's risk of being struck and killed by a crashing aeroplane (Goldstein, Demak et al. 1992). Here, the risk we are discussing is not the probability that one is unfortunately boarding an aeroplane that will crash, but the risk of dying from being "hit" by an aeroplane when the individual is "on the ground". If one does not worry about the risk of a crashing aeroplane, why one fears for a backyard facility? Risk analysts conclude that our society is neglectful and paranoid at the same time (Perdue, Stone et al. 2003). These EJ contenders further stress that a comparative approach is need:

Table 5.6: Annual fatality rates per 100,000 persons at risk

Risk	Rate
Motorcycling	2000
All ages	1000
Aerial acrobatics (planes)	500
Smoking (all causes)	300
Sport parachuting	200
Smoking (cancer)	120
Fire fighting	80
Hang gliding	80
Coal mining	63
Farming	36
Motor vehicles	24
Police work (nonclerical)	22
Boating	5
Rodeo performer	3
Hunting	3
Fires	2.8
1 diet drink/day (saccharin)	1.0
4 tbs. peanut butter/day (aflatoxin)	0.8
Floods	0.06
Lightning	0.05
Meteorite	0.000006

Source: (Slovic 1986:407)[78]

[78] In this table, the mortality from "all ages" is the second highest. Here, the term of all ages refers to those who died due to a function of age.

Table 5.7: Risks estimated to increase chance of death in any year by 0.000001

Activity	Cause of death
Smoking 1.4 cigarettes	Cancer, heart disease
Spending 1 hour in a coal mine	Black lung disease
Living 2 days in New York or Boston	Air pollution
Traveling 10 miles by bicycle	Accident
Flying 1,000 miles by jet	Accident
Living 2 months in Denver on vacation from New York	Cancer caused by cosmic radiation
One chest x-ray taken in a good hospital	Cancer caused by radiation
Eating 40 tbs. of peanut butter	Liver cancer caused by aflatoxin B
Drinking 30 12-oz. cans of diet soda	Cancer caused by saccharin
Drinking 1,000 24-oz. soft drinks from recently banned plastic bottles	Cancer from acrylonitrile monomer
Living 150 years within 20 miles of a nuclear power plant	Cancer caused by radiation
Risk of accident by living within 5 miles of a nuclear reactor for 50 years	Cancer caused by radiation

Source: (Slovic 1986:408)

From the above tables, it is apparent that a risk of 10^{-6} is no more dangerous than riding a bicycle for 10 miles. If that is the case, then the best strategy one should take, as Supreme Court Associate Justice Breyer (1993) once argued, is *not* to reduce a minimal risk to zero but to pay more attention onto the worst thing. In this light, as the third wave hardliners have contended, EJ supporters should stop their groundless outcry for EJ. For them, EJ advocates are outraged by minor risks like pesticides; meanwhile they neglect other major risks like smoking and drinking (Foreman Jr 2003; Perdue, Stone et al. 2003).

Predictably, EJ advocates condemn such a comparative risk approach. The term of comparative itself, they argue, implies a think that because the harm is so small, the risk is deemed acceptable (Montague 1995). For them, even using the term alone may create a barrier for radical change because this definition in itself shapes our perception on what is the most urgent to be done. For the second wave allegiants, the worst things are “prison justice”, “shelter justice” and others, which has nothing to do with environment. For the first wave, the ultimate goal of EJ is risk reduction. As we have repeatedly seen in this chapter, once safety/risk is considered the answer for EJ, its contenders will soon rephrase their question and ask: Why EJ? Why risk?

Why safety? By reshaping the meaning of EJ, our perceptions of what is at risk and what is most urgent to be protected have been changed accordingly.

5.4 Section conclusion: Is risk assessment the answer for EJ?

As seen from the above analysis, researchers from all camps call upon a shift from siting/location to risk in emphasis in EJ research (Been 1994d; Bullard 1994d; Davidson 2003). Once EJ is drawn into the field of risk, EJ researchers have no choice but to conduct risk assessment to estimate the increasing risk posed by the target facilities. The problem is, assessing such risks is nearly impossible and extremely controversial accordingly. Therefore, opinions on the use of risk assessment in public policy are very divisive. They range from positive: "Aiming before shooting" (Reilly 1990) to slightly sceptical: it is not science per se, but a trans-science (Hetes 2007), inexact-science (Applegate 1997), or quasi-science (Cranor 1990) to dismissive: it is pseudo-science (Knox 1996).

The points raised here concern the credibility and uncertainty of numeric risk. All too often, a research conducted by a scientific community tends to claim exclusivity on objective judgement. A judgement like this relies on standardised techniques to provide for consistent findings, and thus objectivity (MacKenzie 2009). This is however hardly the case. The real concern is that although the process of risk assessment is never describing the real world, yet almost always it pretends to be so. The result is, it invites government officials and interested parties to interpret it to serve their own ends (Montague 1995; Cross 1998). As the 1st Administrator of EPA has admitted:

> We should remember that risk assessment data can be like the captured spy: if you torture it long enough, it will tell you anything you want to know. (Ruckelshaus 1984)

This above quote vividly illustrates concerns about abuses in risk assessment. Given enough creativity, a risk assessment can produce virtually any result to fit into the

given policy position (Montague 1995; Lackey 1997). From the case of EJ, we can see that all parties attempt to use the concept of risk, and the subsequent risk assessment, to shape and then reshape the meaning of EJ.

To begin with, what constitutes risk? Meanings attached to the term of risk are known to vary within different research camps. Researchers use divergent equations to shape their perceptions of what is at risk. For example, in the equation of "Risk = Hazard X Exposure" (Shere 1995; Rider, Milkovich et al. 2000), it is implied that risk is simply a mathematical technique. Yet, others may formulate risk as "Risk= Hazard + Outrage" (Sandman 1993). Ironically, although this latter equation considers outrage (perceived risk) as important as actual risk (hazard), its implication is that most people cannot understand, or participate in, risk assessments. Therefore, more efforts should be made onto risk communication. Clearly, most technocrats and politicians seem to believe that issues about risk can be solved technically. Unsurprisingly, EJ activists condemn the technical way that risk is understood. For them, to formulate risk via a simple equation is misleading as it implies that these mathematical equations can fully catch up multi-dimensioned cultural values, historical perspectives, and local concerns. For this reason, they conclude that risk assessment as usually practiced is unethical and thus injustice itself (Montague 1995). Under the umbrella term of risk, the meaning of risk is indeed constructed, then shaped and reshaped over time.

Next, as revealed in most EJ studies, environmental risks are very space- , time- and case- specific. Thus, it is infeasible, if not impossible, to measure all environmental risks imposed in the target area. Similarly, it is highly impossible to understand a risk's past, ongoing or future health impacts fully. The issues are simply too complicated to be wholly assessed. As a result, a typical risk assessment starts from choosing a target risk and the entire process concentrates on this single substance/risk only. It goes without saying, regulators and scholars from different camps use widely divergent values for risk in establishing regulatory standards. People from different parties ask: Why choose this specific risk when there is a full range of alternatives?

As Justice Breyer (1993) has argued, the US regulatory system is dominated by the preoccupation of how to protect "the last 10 percent". According to him, this last-ten-percent mindset has resulted in a serious problem of misallocation of both the regulatory budget and compliance expenditures. To illustrate this point, he vividly describes a *pica* case in New Hampshire. In this case, everyone concerned agreed that this site is clean enough for a child to play there and sometimes eat dirt for 70 days without being harmed. Even so, an extra $9.3 million was spent to increase the playing/dust-eating days from 70 to 245 days per year. To Breyer, this decision seems altogether unreasonable:

> If we are spending somewhere in the range of $4 billion per year life saved on hazardous waste land-disposal bans, while failing to implement vaccination and mammography programs that could save lives at a cost of well below $100,000 per life, something is wrong is wrong, and lives are being wasted. (Breyer 1994:251)
>
> One can discover a fairly widespread view, within a knowledgeable community, that efforts to regulate small risks to health are plagued by serious problems of tunnel vision, random agenda selection, and inconsistency. (Breyer 1994:29)

The above quote shares a typical second-wave thinking: Why waste money on calculating pica behaviour when more people are dying elsewhere? Under the banner of "No risk is acceptable if it is avoidable" (Montague 1995), EJ activists reproach this thinking for being indifferent even when vulnerable children are at stake. They argue that questions, like who asks the questions, which questions are asked and how these questions are asked, control the whole discourse. Thus, the procedures of risk analysis can easily be manipulated and a risk assessment never reaches the conclusion that a risk is avoidable because this is simply not a question that assessors ask. A debate like this is never easy to answer. It is especially the case in the field of EJ because EJ attempts to speak for the most vulnerable (the last 10 percent). However, if too many resources are spent on the last 10%, more people in the majority may die because of this decision. Thus, the benefits of imposing additional procedures for saving the minorities have to be balanced against the repercussions of delaying "public" protections. Evidently, no matter which side one chooses, this

choice is implicitly promoting one's values.

Thirdly, since risk assessment is very information intensive, the third wave camp has a lot to say about the principle that we should base policy on the best available information/data. However, as some (Kuehn 1996; Davidson 2009) have suggested, behind EPA's slogan of "good science", the demanding for a risk-based EJ approach may in fact have nothing to do with the "scientific evidence" that backs up its regulation. The unspoken reason is that reliance on the resource-intensive risk assessment would delay the pace of regulation and therefore hamper the impetus of EJ. Specifically, there are two steps behind the claim for good science. On the one hand, risk assessment has become a different form for the Reagan-Bush(s) de-regulation policy. While ensuring high-quality data is always worthy doing, pursuing "good science" can bring government to a standstill. And, more seriously, data quality will become a goal in and of itself, rather than a means to ensure the public good. On the other hand, because risk assessment is highly data-intensive, EPA's capability of generating sufficient data for such an assessment is dependent on its budget. By cutting EPA's budget, its capacity to act suffers accordingly. As some observed (Davidson 2009), these two steps are the legacy for the Bush Administration.

In 2001, the US congress passed that Data Quality Act, attached to an appropriations bill. This Act authorised the government to develop guidelines for "ensuring and maximizing the quality, objectivity, utility, and integrity of information" (US OMB (Office of Management and Budget 2001). This Act seems harmless, even very beneficial since no one could possibly be on the side of low-quality information. In practice it has however been used as a political tool to hamper regulatory processes. Instead of using this Act to decrease uncertainty, industrial groups use the procedure to alter governmental documents under the very term of uncertainty. That is, uncertainty is originally used to help regulators *act* when certainty does not exist, but now it is used as an excuse for *inaction* (Michaels 2005; Mooney 2006; Shapiro 2009). Similar to the third-wave argument in EJ, under the banner of quality data, rulemaking ossification seems unavoidable.

Put all these together. Without a doubt, a researcher can no longer describe reality as a steadfast phenomenon that presents itself readily for observation, description, and analysis. The rhetoric of risk is often used to undermine the legitimacy of particular political actors.

> The environmental justice perspective became powerful not because it spoke honestly to technical questions of harm or risk – it often did not– but because it appeared to promise something larger, more uplifting, more viscerally engaging than mere careful calculation could offer. (Foreman Jr 2003:185)

At present, EJ requires the freedom to be interactive, to remain flexible enough to find a scientific course that can present new possibilities. Risk-based approach is one of these attempts of finding new possibilities. However, since our understanding over risk is so limited, there is a strong tendency to define EJ in ways that we know how to handle it scientifically. The problem is, if EJ activists speak as if they were risk regulators, people will demand you to act like one. Therefore, it is a mistake to be over-dependent onto risk analysis. As Lackey (1997) has vibrantly described, if your only tool is a hammer, every problem must be a nail. From this light, risk assessment may not be the answer for EJ, because it is unjustifiable to apply the same analytical tool onto every EJ problem.

Another serious issue is, if EJ concerns are translated into a risk-based frame, then the original goal of EJ will be diluted because this risk-framed approach fails to answer larger, more complex public policy questions. As seen in the pica debate, although all parties agree that children should be protected, the attention however has been channelled away from more pressing needs to a minor debate on whether or not children eat dirt. Therefore, it seems a better strategy for EJ to avoid discussing risk. Unfortunately, EJ advocates did exactly the opposite; suddenly, EJ supporters found themselves sinking deeply in the mire of risk assessment debates. Now, I turn to another chapter to discuss how Taiwanese adopt EJ.

6 When different EJs collide: The importation of EJ in Taiwan

6.1 Introduction

Before starting any substantial discussion, in reference to those countries in the early period of their EJ movement's development, it is worth asking: Is there an (real) EJ movement/phenomenon there? (Agyeman 2002) There are no easy answers to this question. It is particularly puzzling when the country referred to is Taiwan. Investigating the Taiwanese EJ movement, surprisingly there is no single grassroots EJ group. However, if one investigates further, one easily finds that this does not mean there is no Taiwanese EJ movement. EJ is not only on the governmental agenda but also attracted a great deal of attention in the 2008 presidential election. Meanwhile, local organisations, like the *Green Party Taiwan*, have occasionally used the term EJ as an ancillary or rhetorical tool in their campaigns. Thus, EJ is by no means an unfamiliar term to the Taiwanese public.

Nevertheless, given that EJ has been broadly adopted in environmental campaigns and policies, one still cannot draw the conclusion that EJ has taken root in Taiwan, as these EJ campaigns can be interpreted as simply a sign that the rhetoric of EJ is accepted. This interpretation invites a series of questions regarding the role of rhetorical boundaries in the Taiwanese EJ movement. One representative question is: Are Taiwanese citizens facing the same EJ problems as those in the US? Since the Taiwanese government and activists are keen to campaign around EJ, it is implied that environmental injustice is a real issue there. Nevertheless, the nature of Taiwanese EJ has not been systematically analysed; activists and researchers simply assumed that because EJ is an issue in the US, it is very likely that this pattern of disproportionate distribution is repeated in Taiwan.

Supposing EJ is real in Taiwan, what does it mean in the Taiwanese contexts? In brief, confronting different situations and problems, a country like Taiwan cannot simply transplant a concept from other countries as such without tailoring it to suit

local needs. To this end, re-interpreting EJ is a must. Intriguingly, sometimes the meaning of EJ is modified so completely one may ask: Under the umbrella term of EJ are Taiwanese and Americans still talking about the same EJ?

These questions had not deeply troubled Taiwanese researchers and activists, because they are previously considered self-evident. This belief that EJ is self-evident continues to surround the discourse of EJ within academia and in the broader culture. Fewer questions have been asked on the nature of Taiwanese EJ. This chapter attempts to challenge this very belief. How EJ arguments are made will be discussed below. Also, whether these EJ theses can be justified will be investigated as well. In so doing, this chapter outlines the main debates surrounding the Taiwanese EJ arguments. Two EJ cases, Lanyu and national park controversies, will be closely followed. In the Lanyu case, we will see that successive sites were chosen for permanent nuclear waste storage and each opposed in terms of environmental injustice. In the national park case, we will see how two versions of EJ are being employed to defeat each other. I then turn to explore some EJ-related policies in Taiwan. Finally, I will conclude with some initial comments regarding the challenges that these discourses are facing.

One more thing is worth noticing before proceeding. Since I am interested in demonstrating the fact that EJ is how we understand, interpret and measure it, cases here were not chosen randomly. Instead, they were chosen to exemplify and clarify the controversies regarding EJ research in Taiwan. Nevertheless, these cases are deemed to be the leading EJ cases in Taiwan. My intent will not be to recount every detail of these cases on the implications of recent work for the understanding of EJ. Rather, I will summarise the overall relevance of this body of work for the questions above-mentioned. Also, I will situate the concerns raised by other scholars in relation to recent historical and political changes that I charted in this dissertation.

6.2 Taiwan in general: Taiwan's demographic and historical profile

From the beginning, Taiwanese activists have faced the problem of how to frame EJ.

In 2006 Taiwan's main ethnic minority population, composed of indigenous peoples, was as small as 0.45 million, comprising only 2% of the total population (Council of Indigenous Peoples 2006). Even so, EJ in Taiwan has been dominated by racial issues (Hwang and Huang 2007; Huang and Hwang 2009a). With such a small percentage of the population of minorities in Taiwan, the question arises as to why EJ was framed as a racial question rather than an economic issue, which would involve more people in the movement.

Some distinct differences differentiate Taiwan from other countries. Firstly, minority groups in Taiwan are composed of indigenous peoples and often considered to be particularly vulnerable. Accordingly, the interpretation of EJ in Taiwan has been driven by issues specific to rural aboriginal peoples. Secondly, unlike some countries which lack an intense, recent civil rights political history (Walker and Bickerstaff 2000), Taiwan has a strong civil rights movement tradition (including aboriginal rights movement). The world's longest period of martial law ended in Taiwan in 1987 after 38 years. Since then, Taiwan has experienced a democratic transformation and the civil rights movement has risen and flourished. Flowing out of the wave of democratisation, the civil rights movement in Taiwan has provided a foundation for the local environmental movement (Ho 2006).

In the same year that martial law was lifted, Taiwan's Environmental Protection Bureau was upgraded to become the TEPA. Since then, TEPA has played a proactive role in formulating a wider framework of environmental protection. Nonetheless, besides reporting on a few EJ news stories and policies from the US, TEPA largely concentrates on protecting the "natural" environment. Minority protection has rarely been considered TEPA business or been factored in their policy-making processes. [79]

Even though the government did not accept EJ until recently, the history of Taiwan's EJ movement can be traced back at least ten years. At that time, human rights activists and environmentalists started challenging the pattern of disproportionate environmental exploitation and risks. EJ related reports and articles mushroomed in

[79] Partially, it is because indigenous issues are considered the job of the Council of Indigenous Peoples.

the post-martial-law newspapers, magazines and journals (Chi 1993; Peng 1999). In 1996, one of the most cited papers by Chi was published. For the first time, "Environmental Justice Principles" were translated fully and systematically introduced into Taiwan. Since then, the EJ principles have been widely cited and become familiar in local campaigns (Huang and Hwang 2009a).

Professor Chi was clearly aware of the marginalised conditions of global indigenous peoples in general and Taiwan's indigenous peoples in particular. In a government funded textbook, he articulated the US theory and cases in environmental racism and then carefully established a link between the US experience and the issues of Taiwanese indigenous peoples. Evidently, EJ was purposefully re-framed to fit the Taiwanese context:

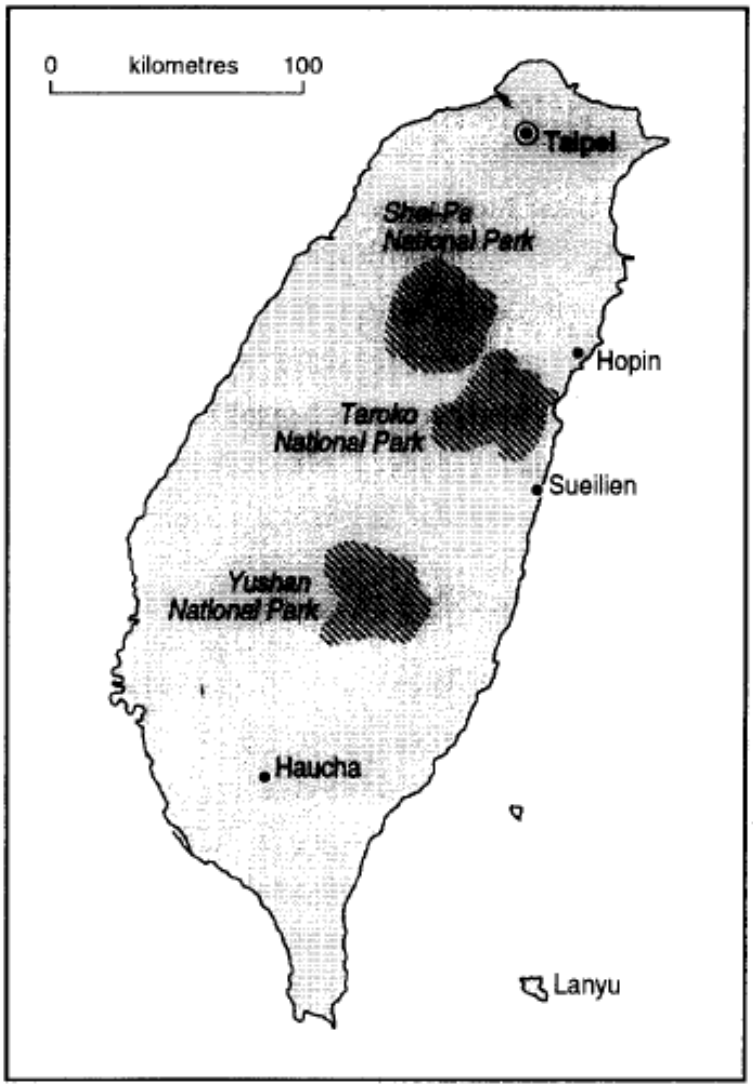
> Some people attempt to interpret this phenomenon above [unequal distribution of environmental risks] as purely economic… Yet, empirical researches over and over again reveal the fact that **race is the best indicator to predict toxic waste landfills and other facilities' siting places**…. (Chi 2006:25 , translated by the author)

Despite taking note that both income and race can lead to disproportionate distribution of risks, Chi and most activists are convinced that race is the most important reason that causes injustice. Thus the Taiwanese EJ movement is consciously framed in the language of environmental "racism". Even though there is no statistical evidence in Taiwan of environmental injustice, the American experience has been used to provide circumstantial evidence.

In 2003, Chi and Hsiao (2003) studied the public's awareness and their support toward EJ in Taiwan. Their striking findings showed that the general public strongly supports EJ principles, such as the position that people have a basic right to clean air and water. However, on specific EJ topics, such as whether establishing a landfill in a low-income community is acceptable, people demonstrate a weaker support. In addition, surveys show that people, to a degree, agree that compensation is an adequate means of resolving nuclear waste issues. This intriguing finding is especially important in the Taiwanese context as it seems that the public did not

really support the EJ framework with which it had been presented. In order to fully understand this, we now turn to two leading EJ cases in Taiwan.

Figure 6.1: Some localities mentioned in this chapter



Source: (Chi 2001:142)[80]

6.3 Lanyu case: Is nuclear waste a modern "Anito" (spectre)?

Most Taiwanese research on EJ deals with a nuclear waste storage site on Lanyu

[80] Taipei is the capital of Taiwan; Lanyu (Orchid Island) is where the temporary storage site for low-level radioactive waste. The three national parks are those located in the traditional lands of indigenous peoples'.

(Orchid Island), which has become symbolic of the Taiwanese EJ movement (Fan 2006). Lanyu is home not only to a nuclear waste storage site, but also to 3,000 Yami aborigines. The Yami people have protested the imposition of this nuclear waste facility since the 1970s, and their arguments can be broadly classified as dealing with substantive and procedural concerns. On the one hand, it is argued that the risk of radioactive waste impacts individual health and the environment. The Yami, on the other hand, also argue that they never agreed to allow this facility to be built on their lands and that the government never consulted with local peoples, nor encouraged them to become involved in the facility's planning. Most of the Yami also believe that the government decided to establish the facility on Lanyu because its inhabitants are a powerless, tiny ethnic minority (Wei 2001).

> The government [chose] indigenous people[s' land] for several reasons: their lands are some of the most isolated, they are some of the most impoverished and, consequently, most politically vulnerable. (Tsai 2002)

Lanyu's case has demonstrated a range of features in the Taiwanese EJ movement. First, Lanyu case displays its highly-racialised aspect. Given that aborigines are the most vulnerable, both individually and collectively, Lanyu seems to offer a reasonable opportunity to promote EJ racially rather than within a socio-economical frame. Thus, Taiwanese EJ literature is dominated by racial discourses, or environmental racism.

> It is an typical case of a evil "fraud" that Taiwan[ese] put the nuclear wastes onto Lanyu. This "Huan Jing Zhong Zu Qi Shi Zhu Yi" (Environmental Racism) is also the most common symptom in a nuke-tech civilisation, because indigenous peoples are the weakest minorities and victims within the dominating nuke-tech.(Lin 2001; originally in Chinese translated by the author)

Second, the Lanyu case can be categorised as a case-based approach. There is little substantial evidence available on how environmental risks are distributed. To pass around this difficulty due to the lack of evidence, activists reframe EJ and refocus it on specific facilities, which frees them of the necessity of dealing with the issue of finding distributive patterns.

In the process of reframing the issue, activists have mounted a series of campaigns to fight against the injustice of dumping nuclear waste in Lanyu. There are three chief arguments found in the literature. First, it is argued that aborigines in Lanyu are forced to accept the waste without enjoying any of the comfort and convenience of nuclear power. Group leaders and aboriginal rights activists invoked, in part, their identities as indigenous peoples to press a claim of EJ against the repository.

> [W]hile the electricity generated by the nuclear power plants is consumed only by residents on the mainland, Dao [Yami] people are forced to live with the wastes. Environmental injustice, in this sense, is built in nuclear reactors. (Chi 2001:146)

Secondly, the nuclear waste site was described as fully concentrated on Lanyu. Since Lanyu is "the only site" for depositing nuclear waste, its distribution, if any, is always 100 percent. This frightening concentration "rate" has given indigenous peoples fresh impetus to pursue social justice in Taiwan.

Thirdly, activists are keen to prove the existence of deliberate discrimination and argue that Lanyu was chosen for purely racial reasons. Moreover, the government was accused of deceiving the locals. The lore of "fish cannery con" is oft-cited in literature:

> In 1980, construction work began on the southwest edge of Lanyu and many Dao [Yami] were told that the government was building a fish-canning factory for them…. In 1982, the 'factory' was completed. However, instead of producing caned fish, the 'factory' started to receive canned nuclear wastes. (Chi 2001:144-145, emphasis in origin)

These strategies have successfully attracted public attention. Accordingly, most people consider Lanyu a textbook EJ case. However, as time goes by, these arguments are being challenged with the counter-arguments.

6.3.1 Counter-arguments: Is Lanyu really an environmental injustice case?

After a popular TV documentary, Our Island[81], made a series of episodes on nuclear waste issues the fishery-con story has become widely known. Almost all my interviewees quote, some vividly, how evil the government was to coax the Yami into hosting the site. Used as anecdotal evidence, activists condemned government's involvement in deliberate deceit. While prevalent among environmentalists and local residents, it is said that this alleged fraud, fish cannery con, deliberately ignores the other side of the story: that of Tai-power. Owing to their political incorrectness, the Tai-power side of the story were left out. For Tai-power, the fish cannery con is a popular myth. Refocusing the story, different angles can be provided from the side of Tai-power.

The counter-argument asserted that the fish cannery story not only distorts the facts but also attempt to put the causality upside down. An anonymous staff put the company's case thus: Considering the political atmosphere of authoritarianism at the time, did the government need to practise deception? (Liu 2002) It is to say, from the standpoint of Tai-power, if the government really wanted to establish a repository at the time and in that political atmosphere, they could simply unilaterally force locals to accept the site. There was no need, at least unthinkable, for the government to "cheat", instead of coercing the population during the period of "White-terror" (McCarthyism). Language barrier may be responsible for the misunderstanding, according to the staff. One possible explanation for the fish cannery story is that, during the construction of the site, some non-Yami speaking officers may have depicted the nuclear waste barrels as "canned fish-like" (Liu 2002). This erroneous information then swiftly spread out. That is how locals got the mistaken impression that the Yami are deceived.

Take it a step further. Investigating the Lanyu case from a broader perspective of the country's overall energy-waste policy, additional otherwise omitted perspectives may be recovered. As indicated by one of my interviewees, the construction of the Lanyu site might have been due to faulty policies in which unforeseeable factors played a role. If that is the case, how these unforeseeable factors are construed will affect the

[81] See: http://www.pts.org.tw/php/html/island/island.php, especially episode 167, 188, and 358. During the interviews, some even urged me to watch the whole series of the show.

final judgement on whether Lanyu represents an instance of EJ.

As suggested by US experts, after Taiwan's first nuclear plant was established, ocean dumping of waste was introduced on an experimental basis. Originally, Lanyu was only a "transfer station" for ocean dumping. Then, unexpectedly, the London Dumping Treaty was passed in 1982. With ocean dumping banned, the government had no choice but to seek an inland storage facility. For this reason, the experimental transfer station in Lanyu hastily became an inland repository.

> [A]t first, Taiwan followed US experts' suggestion of using ocean dumping to tackle [nuclear wastes]. Later, it was also experts who found the extreme danger of ocean dumping so that it [ocean dumping] was banned around the world. In haste, Taiwan chose Lanyu as a temporary storage for nuclear waste (using the meanest way to bully the Yami people). (Zheng 1998, Chinese in origin translated by the author; brackets in origin)

Apparently, both the government and environmentalists agreed that Taiwan experienced a U-turn on nuclear waste policies in the 1980s. Their interpretations of this history is however very different. The government, like the Atomic Energy Council (AEC) (Li 2006), is inclined to consider that the best choice possible had been made given the circumstances. Conversely, environmentalists tend to argue that a lack of foresight in policy is responsible for tempting the government to pursue ocean dumping. For them, unforeseeable incidents provide no good excuse for the final placement decision.

> That the policy of "temporarily" storing nuclear waste on Orchid Island has long caused environmental injustice and affected the health and social psychology of its residents is well known. (Chi 2002, emphasis in origin)

Accordingly, whether or not it is unjust to store the waste on Lanyu is largely dependent on how the question is construed. Those whose views are consistent with the above-mentioned quote are firmly convinced that the siting decision in Lanyu demonstrates nothing but implicit environmental "racism". Conversely, for those who agree the premise that Lanyu case is incidental may be less inclined to describe the situation on Lanyu as unjust/injustice. In this light, Lanyu appears to be more

about procedural justice, rather than a clear-cut case for environmental racism. In other words, it is an environmental injustice case for the reason that local prior consent had not been received before the establishment of this site. The government appears to adopt the latter point of view.

6.3.2 The official decision: Lanyu storage is an injustice case anyway

In 2002 Primer Yu went to Lanyu on behalf of then-President Chen. Yu officially apologised to the Yami for the government's past policy of storing nuclear waste in Lanyu. Meanwhile, he promised to try his best to eventually remove the radioactive material from the island (Taipei Times 2002a). In response to Yu's apology, the Executive Yuan (the Taiwanese Government) established two councils, the Orchid Island Nuclear Waste Relocation Promotion Committee (CLYRR) and the Orchid Island Community Development Committee[82], to undertake the task of relocation and to tackle the issue of compensation for the Yami people:

> All the members of the [CLYRR] council, including representatives from Tao [Yami], legislators, and experts in academia and governmental delegates, have recognised: Due to the closed procedure in the past, nuclear waste storage was established onto Lanyu. It is a serious mistake. We have to look squarely to the extended complaints from the Lanyu residents and resolve the removal of the nuclear waste storage as soon as possible. (CLYRR 2002, translated by the author)

In 2003, the government further assured the public that the previous policy of siting nuclear waste storage in Lanyu was unjust and violated the principles of EJ. The government admitted that it is unfair to ask the more vulnerable Yami to shoulder the risks. For the first time, it is officially confirmed that Lanyu is the very EJ case in Taiwan.

[82] Their official website uses the acronym *CLYRR* without explaining what these letters stand for. As a result, the English translation here is adopted from a local major English-language newspaper article. See: (Taipei Times 2002b).

> Every citizen should have the rights to enjoy a safe, healthy, and comfortable environment for living. To increase the environmental quality in each region, we [it is not clear who are the "we" here] should make every effort to reduce the facilities that damage people's environmental rights. The decision to site a nuclear power station or nuclear waste storage affects surrounding peoples' environmental rights and interests. To be just, it would have been essential to obtain locals' consent beforehand and to provide reasonable compensation should be provided as well. It is the only way to be fair and just. In the past however, when the nuclear facility is established, the state [government] did not take locals' rights and interests into account. This is especially so in the case that nuclear waste was to be temporarily stored on Lanyu. To this extent, the siting policy violated environmental justice, because the local indigenous people's living standard is not as high as the main-island of Taiwan; the natives, however, have to bear risks from the nuclear waste. Thus, "Nuclear-free Homeland" will improve environmental quality and uphold environmental justice. (Government Information Office (Taiwan) 2008; originally in Chinese, translated by the author)

Since a consensus has been reached on removing all of the waste from Lanyu, the government and Tai-power now have to find a final repository for the waste on Lanyu. The government can either export the waste to foreign countries or grapple with it domestically. In the latter case, the government has to further decide whether or not to move it back to the main-island or send them to another nearby island, as happened in the Lanyu case.

6.3.3 Dumping in North Korea or US?

Over the past decades, Tai-power and the government have contacted authorities from home and abroad. A series of candidate countries[83] have been short-listed for the treatment and permanent disposal of Taiwan's waste. Concerning storage abroad, according to the government, as long as the recipients are willing and capable of handling the waste, the policy of exporting is feasible (Taipei Times 2008b). North Korea, China, Russia, and the US are all being considered as the final site for storage. All these choices, by leveraging different discourses of EJ, have faced bitter opposition from local and international environmental groups.

[83] Considering space and time, only the most controversial cases are reviewed below.

The first three countries listed above raise objections for the reason that they are regarded as incapable of dealing with radioactive waste. Further, Taiwanese environmentalists closely aligned themselves with international environmental groups, such as Greenpeace[84] and asserted that Taiwan's intention to export nuclear waste to other countries has created a negative image for Taiwan in the international society (Green Party Taiwan 1997a; 1997b). Not to mention how controversial it is to ship any re-extractable radioactive materials to one of the evil axis, "North Korea". Meanwhile, by invoking the Basel Convention and the London Dumping Treaty, environmentalists asserted that exporting nuclear waste to a third-world country, like North Korea, would be a clear violation of international laws and the principles of "EJ". Activists from South Korean even went on hunger strike over this matter (Green Party Taiwan 1997a; 1997b; Chiu 2001; Shih 2007: 451-457).

Before long, Taiwan's attempt to export waste attracted attention in the USA. It specifically sparked off considerable debates in the US House of Representative. As Congressman Foley said:

> Again, I want to enter into the RECORD the fact that we raised the issue, we will continue to pursue the issue, we do not want to see Taiwan send its nuclear waste to North Korea under any circumstance. (Foley 1997)

It should come as a surprise to no one that, due to fierce oppositions, Tai-power failed to deliver any nuclear waste to North Korea for permanent disposal. The disposal contract accordingly cannot be fulfilled and later Tai-power was almost taken to an international court by North Korea for breach of contract (Taipei Times 2004).

Arguably, it is relatively a straightforward violation of EJ principles to export nuclear waste to developing countries where those countries would have difficulties

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[84] See their website: http://archive.greenpeace.org/comms/no.nukes/waste02b.html and http://archive.greenpeace.org/pressreleases/nucwaste/1997may15.html

in dealing with radioactive waste. Concerning exporting this waste to the US, reactions from the environmentalists have been mixed and ambivalent. When asking about the US EJ movement, one of my interviewees, a famous Lanyu activist, responded drastically:

> What? You compare our [anti-nuclear waste] movement with the US [EJ movement]? Don't even start with me about the US. The whole [nuclear] technology is imposed by the Western Imperialism. If you want to talk about EJ [with me], the first thing you should do is to criticise the Western control over the Third World, surely [their control over] Taiwan as well. (Originally in Chinese, translated by the author)

Because of the US's involvement in Taiwan's nuclear policy, most environmental groups appear more likely to support a proposal to ship Lanyu's waste to the US. In different tones, Taiwanese environmentalists generally hold that it is the responsibility of the US to process, at least the high-level radioactive waste, because Taiwan's pro-nuclear policy itself was initiated under pressure from the US government (Green Party Taiwan 1997b; Shih 2007:452). Taking a much softer tone, the previous TEPA director, Professor Kow-Lung Chang, echoed the viewpoint that US should take responsibility for processing the waste on the grounds of *after-sales service*, which would help Taiwan tackle the problem (Huang 2008).

Owing to the general ambivalence, the US has become an unreliable friend to the Taiwanese EJ activists. On the one hand, Taiwanese environmental groups sent their activists to Indian Reservations in the US to learn from their first-hand experience in anti-nuclear waste campaigns (Kao 1998). These very Taiwanese groups, on the other hand, also support a policy of exporting nuclear waste to the US. The proposal to export to the US was finally dropped, but for purely economic reasons as the US charged almost 2.5 times more than North Korea (Jeng, Yang et al. 2002). Paradoxically, if these Taiwanese groups were to follow the logic of their proposals and US practice, it might be seen that the very reservations visited might be chosen as the final hosts of the Taiwanese waste. Had that happened, it would have been yet another injustice/EJ case, according to the Secretary General in *Green Party Taiwan*.

6.3.4 Grappling with the waste domestically: Offshore or onshore?

Since exporting waste abroad is no longer an option, dealing the waste domestically has become the only choice. Tai-power has two options: offshore or onshore storage. Yet again, Tai-power has tried both ways but has failed so far, due to fierce oppositions from the locals and environmentalists. Unlike the export cases however, this time these two agents are not as closely aligned with each other as before because their goals are slightly different.

Over all these years, a couple of potential sites have been considered. With limited space, only three of these cases, two inland and one offshore, are exemplified here. In addition, a case adjacent to two candidate hosts will be explored as well.

6.3.4.1 One Offshore repository case: Wuchiou

Wuchious was one of the chosen sites for the nuclear waste. It has later become a famous environmental injustice case in Taiwan. After defeat by the Chinese Communists, the nationalist party (KMT) retreated to Taiwan. Besides the main-island of Taiwan, the KMT government still controls some islands on the outskirts of China's Fujian Province for military reasons. The two-island Wuchiou Township is one of outlying islands that are still under Taiwan's control. Since it is far closer to the Mainland, Wuchiou is often called "the most outlying of all outlying islands". Even today Wuchiou Township, administratively speaking, remains to China's Fujian Province instead of Taiwan Province.

Figure 6.2: Maps of Wuchiou

Source: Wikipedia

Source: http://www.american.edu/ted/ice/orchid-waste.htm

In 1998, Tai-power announced a proposal to move Lanyu's nuclear waste to one of its islands. This controversial project invited great debates until it was dropped in 2002. It is not hard to know why Tai-power chose Wuchiou as a potential storage site. First, it is a small island located far away from the main-island of Taiwan, but sits close to mainland China. Second, there are only 400 civilian residents on the island. Since the town is a fort itself, most of its economy is controlled by the military; for all these years residents there are used to obeying instructions from the army. Furthermore, since all the residents there are Han/Chinese, critics could not point to environmental "racism", as happened in Lanyu, to criticise this siting decision:

> [T]here is no justice and social welfare for the people of Wuchiou, judging by the government's plans to move the nuclear waste site from Lanyu to Kinmen [Wuchiou is in Kinmen County] . (China Post 2002)

However, the announcement of Wuchiou was met with bitter protest among local residents. Again, the decision to store waste on Wuchiou is labelled an environmental injustice by environmentalists and the locals. Yet, this time they condemned Tai-power's "regional discrimination/injustice", rather than racism (Hwang and Huang 2007).

As happened before, Tai-power had to drop this project. However, this time a rift emerged between Lanyu and Wuchiou over the siting decision. One of the most dramatic changes happened when the Secretary-General of Wuchiou shouted at former President Chen, condemning Chen's government for failing to protect the Han/Chinese people, the majority of Taiwanese, in Wuchiou:

> …Lanyu has plenty of political resources since many nonprofit groups have been advocating on behalf of aboriginal people on the island. Instead, there is no help available to the 400 plus Wuchiou residents because they have been quite [sic.] and tame, she said. […]Wuchiou is in a much weaker position compared with Lanyu in terms of resources and benefits, she said, adding that the remote town has no "election value" because it's only accessible by naval ships every ten days.(China Post 2002, emphasis in origin) [85]

As can be seen, using similar EJ language, the Wuchiou people felt they are even more powerless than the Yami in Lanyu. They feel themselves to be aliens in their own homes on the grounds that they are not "aborigines". Besides, most environmentalists, including some of my interviewees, asserted that the Wuchiou's announcement is a violation of "regional" EJ since Tai-power tends to select surrounding islands as permanent storage, saying that this shows nothing but Tai-power's unwillingness to grapple with this waste on the main-island. Since sending

[85] The reason why she asserted that Wuchiou people have no "election value" is because according to the Taiwanese Constitutional Amendments, three members each should be elected from lowland and highland aborigines. Thus, in the 113-seat Legislative Yuan (Parliament) there are at least 6 indigenous legislators, even though indigenous peoples construct only 2% of Taiwan's total population. See: (Additional Articles of the Constitution of the Republic of China (Taiwan) 2005)

waste to another island is yet another form of injustice, now we turn to see some onshore cases to see if they are "just" choices.

6.3.4.2 Some onshore repository cases: No matter where it goes, it is still injustice

As discussed, the EJ advocates argued that the waste must be removed from Lanyu because:

> The Tao [Yami] people is [sic.] angered by the continued deception from the authority and cannot withstand any further shipment of nuclear wastes that are threating [sic.] the integrity of our environment and the survival of our people. The Tao people have no share of the benefits of nuclear power but have instead endured the serious danger of nuclear wastes. (The Association of Overseas Tao in Taiwan 1995)

Moreover, although the consensus of removal has been reached, advocates and the government cannot agree on the site for final repository. EJ activists have opposed to almost every single siting decision. One of the disputations is whether or not the aboriginals are more likely to be selected:

> From the past until the present time, indigenous peoples in Taiwan are facing the aforementioned press and threat from "environmental colonisation". Yami people have lived with Tai-power's evil spirit [Anito], nuclear waste, for so many years. However, three out of five future host counties favoured by Tai-power for the nuclear waste are still on the homelands of indigenous peoples. (Chi 2009, emphasis in origin; originally in Chinese, translated by the author)

In October 2008, the government pronounced its latest three potential final storage sites: one, an outlaying island in Wangan Township, Penghu County; the others (Mudan and Daren), located in inland Aboriginal Townships. Being selected as candidate sites, this governmental announcement met with mixed reactions amongst villages. In the island case, its Han/Taiwanese inhabitants are firmly opposed against the announcement; the inland Aboriginal Townships, however, have shown less hostility toward the project. The following section will focus on the later two townships and further explore how villagers were enacting their own conception of

EJ to counter the environmentalists' EJ arguments.

6.3.4.2.1 PIMBY: Put/please in my backyard

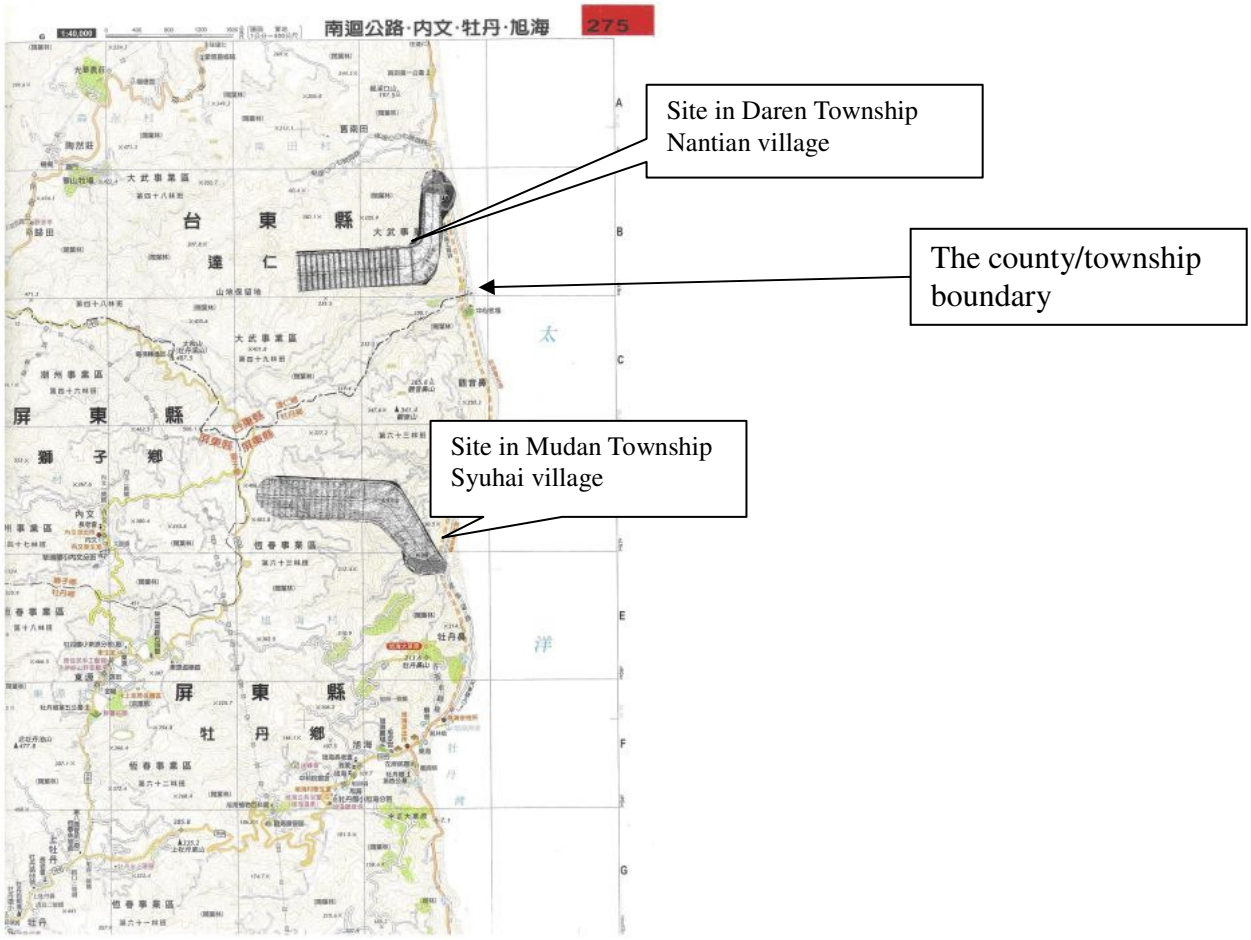
In order to mitigate the local resistance toward nuclear waste, the Taiwanese government passed legislation to regulate siting criteria for nuclear waste. Suffering so many setbacks for so long, this act stipulates the processing and suitability requirements so as to ensure that everything under the law complies with the relevant safety standards; meanwhile Tai-power is authorised to offer generous incentives to those affected at each potential site (Shih 2006). Up to 30 million NT dollars (almost 0.6 million pounds) will be provided first, as long as these candidate sites agree to conduct a geological suitability survey. Once the final site is determined, a more generous 5 billion NT dollars will be provided to the final host (40% goes to the host village, 30% to neighbouring villages, 20% to the host county or city, 10% for contingency plans) (Taipei Times 2008a) .

Meanwhile, this law requires a *county-wide* referendum as part of the siting process, meaning that whether or not the host village approves of the site, it is the county which has the final say; it is therefore possible for the county to override the village's decision through referendum. Because it is not uncommon to have an opinion gap between village and county, residents at different administrative levels often demonstrate completely different reactions toward the siting decision. In general, at the county level residents reacted with concern and voiced bitter opposition; the chosen townships, however, have proven more likely to welcome the prospect of bringing jobs or compensation to the local economy. These townships have been firmly convinced that the candidate villages should at least use the siting process to get some compensation.

These local attitudes have been censured for selling out the environment by EJ activists (Taipei Times 2008c; 2008d). The chosen townships have not only refuted the allegations but also contested the EJ discourse buttressing such allegations. In so doing, they attempted to reframe the concept of EJ from equal treatment/distribution

to indigenous peoples' lives and intergenerational justice.

Figure 6.3: A map of Daren and Mudan Townships



Source: (Nuclear Information Center 2002b)

The local leaders and mayors from neighbouring townships are interviewed by a pro-nuclear group, Nuclear Information Center. During the interview, the village heads criticised other EJ advocates for providing a skewed picture of EJ. As mentioned, Lanyu case is considered unjust for the reason that the Yami there have never benefited from the nuclear power responsible for its production. These chosen host-site leaders, however, are of a different mind on this matter:

> Some say that it is bullying the indigenous peoples to put the unwanted wastes [by others] onto our home[land]. Why [do] these wastes belong to others? Those wastes are generated from electricity and then have been enjoyed by all of the Taiwanese…Everyone of us has enjoyed the benefits

> of this technology. Therefore, it should be buried in our own land. If we do not to manage it today, it [the problem] will be push back to our descendants. Don't you feel afraid that our descendants may blame us [for doing so]? (Nuclear Information Center 2002a; originally in Chinese, translated by the author)

Evidently, two arguments in terms of EJ are used here. On the one side, by arguing that "every single Taiwanese" has benefited from the comfort and convenience of electricity, these leaders refuted the argument that Lanyu has never used the electricity generated from nuclear power. On the other side, intergenerational justice was used to dispute the most prominent EJ discourse, i.e., the Lanyu version of EJ. For them, the Lanyu discourse is indefensible for the reason that it does not bring future generations into consideration. Deriving from geographically differentiated social, political and cultural processes, in different regions of Taiwan race and equal treatment/distribution may not be considered the most important factors. In the controversy of nuclear waste, other critical discourses also have the potential to foster alternative versions of EJ.

All over the world, indigenous peoples are facing serious fiscal and social problems; to these Taiwanese villages there are no exceptions. Having been deeply in deficit for so many years, it seems infeasible to blame the locals for considering the possibility of hosting this waste:

> Indeed, only intellectuals are blaming Daren Township [for accepting these wastes]. They [the intellectuals] are driving Mercedes, but we are riding bicycles. I really hope that my fellow villagers are stuffed to death [like the intellectuals are] rather than starving to death. (Nuclear Information Center 2002b)

In the meantime, referring to a map, one easily finds that although Daren and Mudan Townships are located in different counties, the two candidate sites are in fact close neighbours. Since the potential sites are very close to each other, the phenomenon of PIMBY has occurred (Taipei Times 2008d). Since my backyard will have been affected anyway, the locals are more likely to take the position that they ought to host the waste and enjoy some benefit for doing so:

> Now, most villagers think that no matter whether the final repository is in Nantian or Syuhai village, it is indeed the same thing because these two sites are only separated by the mountain of Guanyinbi. Instead of putting it in Nantian, [the villagers in Syuhai] would rather have it on their own land in that they can directly benefit [from it]. People can get more compensation. The difference is as big as 1500 million NT dollars [around 2500000 pounds]. (Nuclear Information Center 2002a; originally in Chinese, translated by the author)

For similar reasons, the mayor from neighbouring Dawu Township argued that the current standard in deciding compensation is unfair, since there is a geographical link between Dawu and Daren. He suggested the government revise its compensation standard to "include" Dawu into the siting scheme. He further urged the government to use the Dawu Harbour, instead of building a new one, as the transfer station. With this new policy package, then basic fairness, he insisted, can be achieved toward Dawu residents (Nuclear Information Center 2002a).

It should surprise no one that both the environmentalist and indigenous civil rights activists accuse the government of buying off the locals and public opinion. Some aboriginal activists went to throw eggs at the Council of Indigenous Peoples and demanded resignation of its minister for failing to protect her own people from the threat of nuclear waste (Taipei Times 2008a; 2009a).

Although it is an ongoing debate over the PIMBY aspect, judging from previous experience it is highly possible that the county where the referendum is held will vote "No" on the issue, while the township votes in favour. That means that, for the EJ advocates, the best strategy is to lobby the county already inclined to vote "No," rather than making efforts to convert the township where 60% of the population is in favour of the siting proposal. In the future, it is very likely that the mistrust between EJ activists and the locals/villagers will be broadened if the activists keep ignoring the villages' voices.

6.3.4.2.2 Returning the waste to where it was produced: A "just" case?

Since the idea of siting waste onto another aboriginal tribe invites criticism of environmental racism, one of the best choices is to relocate the waste to a non-aboriginal inland site within the Taiwanese main-island. Echoing this thought, it has become widely accepted among activists to return the waste to where it was produced:

> No matter where it goes, it is still wrong, I think. It should be moved to the original nuclear plants. That is the best place to store it, since a 4 or 5 km radius is already contaminated by the radioactivity already, isn't it? When the plants are full of nuclear waste, then they [the government] have no choice but to stop producing nuclear wastes. [Interview: Originally in Chinese and translated by the author]

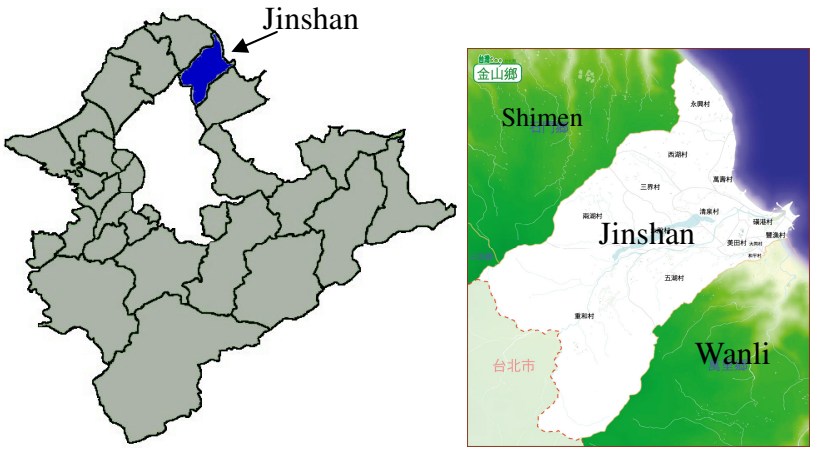
> … [T]he Yami are asking that the facility be immediately closed and that all the waste be returned to the nuclear power plants that produced the toxic waste.(Global response 1995)

Since these sites are already polluted, it seems possible to send Lanyu's waste back to where it originated. However, such a policy begs two fundamental questions. Firstly, the argument to "send the waste back to Taiwan (or the site of nuclear plants)" implies that most Taiwanese are living in a nuclear-free environment. Therefore, other Taiwanese somehow are shouldering fewer nuclear burdens than that of the Yami. This is however by no means the case since all three nuclear plants (and the forthcoming fourth one) are located in the main-island of Taiwan. Secondly, an argument like this fails to answer whether or not it is justifiable to concentrate all nuclear pollutants in one area. Clearly, a full picture is still wanting in the above-mentioned quotes.

In order to clarify the aforementioned questions, instead of choosing a site of nuclear plants as example, a non-host Township is chosen here. Among the "returning-waste-to-main-island" debates, Jinshan may be one of the most famous cases. As discussed, Lanyu only stores low-level waste; high-level waste is stored in the site of three existing nuclear plants. After the Lanyu was full in 1995, all the wastes, low- and high-level ones, are stocked up in these plants.

Among them, two of the plants are located in Taipei County: One in Wanli and the other in Shimen. Consulting a map, one could find how close these two plants are.

Figure 6.4: A map of Jinshan, Shimen and Wanli



Source: Wikipedia

Jinshan is not a direct host for any nuclear plants, but it is in the middle of two nuclear plants. Since it does not host the contaminants, it draws less attention and compensation. Similar to the Dawu case, the Jinshan residents are angry about their allocation of compensation. It is reported in the prevailing documentary of Our Island:

> Residents in Jinshan Township have got a lot to say about the nuclear waste!...Jinshan Township is located between two nuclear plants, not to mention the fact that the second plant is less than 5 minutes away from the town centre of Jinshan by car. For such a long time, the locals' worry is no less than that of the Lanyu's! The waste stored in Lanyu is only low-level; the high-level waste produced from the second plants however has not yet even left the gate of the second nuclear plant since its operation... Jinshan is not only the location of the second nuclear plant but also a repository for both low- and high-level wastes. If [the government] cannot find a final storage at last, then Jinshan will become a mutated storage [but without the name of a storage]. The site for the fourth plants has got establishment funds. Lanyu has got nuclear-waste compensation. Jinshan has got only 63 million NT dollars [around 1.2 million pounds] as operational funds. Can you submit yourselves to this [unfair] term? (Ceng 2009; originally in

Chinese, translated by the author)

Clearly, residents in Jinshan are furious over the "sending-the-waste-back" argument since they already shoulder a disproportionate burden due to nuclear industry. In reality, they suffer more, not less, risk than of the residents of Lanyu as both high- and low-level wastes are located in/near their backyards. Besides, Lanyu and other host sites receive generous subsidies from Tai-power. Jinshan, however, has not been fully compensated just because, administratively speaking, they are "not" a host site.

Take it a step further. The most important reason that backs up the "sending-back" argument is that these nuclear plants have been contaminated anyway. However, similar argument can be used to against Lanyu as well: Since Lanyu is polluted by the waste already, why bother to move? Regarding what should be accounted as injustice, it further begs a question of inclusion and exclusion.

6.3.5 The politics of inclusion and exclusion in the Lanyu case

If we closely follow the US's definition on EJ and construct a buffer around the site of Lanyu, then it is likely to find the politics of scale/buffer as happened in the US. Among all the literature, it seems that people tend to treat administrative districts as given without asking the question of why Lanyu, Jinshan as well, are accounted as a whole.

Indigenous peoples comprise only 2% of Taiwan's total population. However, considering the Taitung County (where Lanyu is located) alone, then the aboriginal percentage increases to about 50%. Since 90% of Lanyu's residents are the Yami, comparing with either Taiwan in general or the Taitung County, Lanyu is undoubtedly an "aboriginal" community. Probably because of these geographic and demographic features, the islet of Lanyu is always treated as a territorial integrity. This 45 square kilometre island however is in fact more heterogeneous than we originally thought.

As Tai-power and other nuclear experts addressed, Lanyu's Longmen area is chosen for several reasons: the area faces the sea but is encircled by mountains; around the site there are no residents in 5 kilometres of radius (if not counting the dormitory of Tai-power) (Nuclear Information Center 2002c). If that is the case, then whether environmental "racism" exists is largely dependent on how big the buffer/circle we draw and who we intend to include into the scheme.

Because of the dense population, the ACE (2007) at first set its EPZ (emergency planning zone) at 0.5, 1.5 and 3 kilometres for Taiwan's three nuclear plants. Due to bitter oppositions from the environmentalists, the ACE later uniformised all EPZs at 5 kilometres in radius. This standard of a five-kilometre EPZ was designed for nuclear plants, not for a nuclear waste site. Yet, suppose a buffer is drawn at five kilometres in Lanyu, it goes without saying that in theory no "injustice" can be found, given that no residents are living in the area.

Surely, one can further argue that even though the Yami do not live within the Longmen area, they still fish in the surrounding seas of Longmen. As a result, outside this buffer residents are still affected by the waste. Likewise, one can also dispute that a radius of 5km is too small to prevent the locals from a radiation emission incident[86]. It is however equally true that Lanyu as a whole is not the sole unit of analysis that we can use for the measurement of EJ.

Similar phenomena in terms of inclusion and exclusion can also be found elsewhere. In asking safety issues, it is very easy to get furious responses from the interviewees. During my interviews, the "if it is safe… why not…" account is addressed repeatedly. Representative comments included: If the waste is as safe as they (experts/officials) asserted, why don't they bury it under the Office of the President? Similar emotional arguments can be found in academic writings as well:

> The government proclaimed that nuclear wastes are 100 per cent safe, so that the Dao [Yami] people should not be worried about these facilities

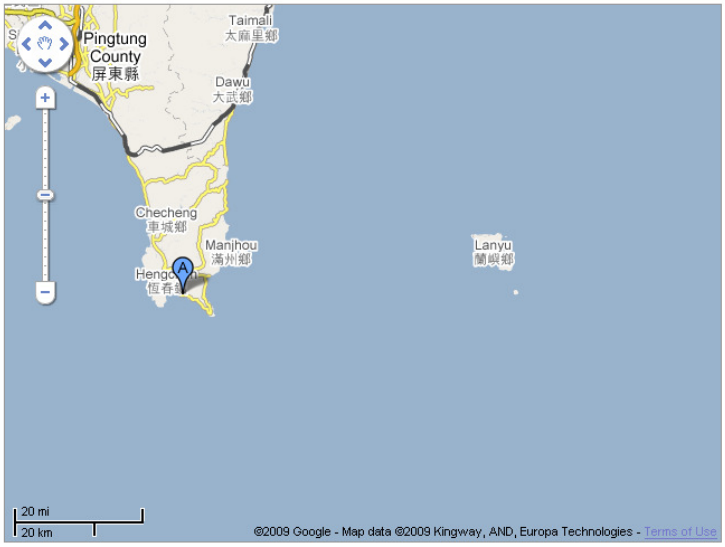
[86] For instance, some argued that EPZ should cover 16 to 32 km from the unclear plant. However, given that there are around 6 million people live in Taipei metropolis to draw a buffer as big as 32km is impractical. See: (Shih 2006).

> ["the" facility on Lanyu]. However, these words brought no comfort to the Dao [Yami] people. They reason that if nuclear wastes are 100 per cent safe, why bother shipping them 400 kilometres from northern Taiwan to Lanyu?(Chi 2001)

On compassionate grounds, it is understandable why residents and environmentalists have long lost trust in Tai-power and the government. Considering their notorious history on environmental protection, the locals have every reason not to believe that the wastes are safe. Also, as some of my interviewees noted, nothing is 100 per cent sure. For them, the alleged promise or 100 per cent safety means nothing but political rhetoric. Unfortunately, the aforesaid quote painted only a partial, or even emotionally biased, picture on the issue.

To begin with, Lanyu has been stored some 97,000 barrels of low-level waste from Tai-power's *three* nuclear plants. Among these plants, only two of them are located in Taipei (County), as addressed in the Jinshan case; the other, also known as the third nuclear plant, is located at the south end of Taiwan. Located in the south as well, Lanyu is only some 42 nautical miles, around 80km, off Taiwan's southeast coast (Taipei Times 2002a). Thus, not all wastes are shipped 400km from northern Taiwan.

Figure 6.5: The locations of Lanyu and the third nuclear plant (marked as A)



Source: Google Map

For another, it is often said that the northern Taiwan is weighted more than the south in most scholarship and policies. Thus environmentalists and scholars, including the above-mentioned quote, tried hard not to analyse Lanyu from a Taipei lens. This very quote however suggested the very opposite. As seen, only the plants in Taipei are considered in the EJ scheme; the third nuclear plant was excluded from their discussions. In the very quote the south of Taiwan is still missed out. Thus, in spite of criticising the standardised Taipei lens, it seems that the author did not do anything different himself. The plants in Pintung was excluded from his analysis and become invisible.

6.3.6 Section conclusion: Lanyu as a leading but "atypical" EJ case?

As I (2007; 2009a) have indicated elsewhere, as a movement, EJ is struggling to come to terms with a rapidly changing situation. The removal of nuclear waste has been demanded by both locals and environmentalists, but the movement has said nothing about how and where unclear waste should and could be disposed. Specifically, the previous understanding, which simply labels Lanyu as an EJ concern, has been proved limited. At the early stage of promoting EJ, it is very useful to give a case an EJ label in mobilising people. By using the "fish cannery con" lore, activists have successfully attracted a great deal of public attention toward Lanyu's nuclear waste repository. After the goal of attracting public attention has been achieved, a methodological shift is needed, I suggest. Future research should pay more attention to the way of setting achievable targets for delivering EJ.

Failing to do so, activists may find themselves land into a weak version of the EJ argument, as Been (1994b) criticised the American EJ thesis. For instance, under the contemporary EJ discourse, structural changes are often required by the activists:

> Our anti-nuke-waste movement is a problem regarding all minority groups [in Taiwan]. It is about how ridiculous the government's minority policies are….It [the movement] is about the public policy. (Interview: originally in

Chinese translated by the author)

For him, the scope of Layu's anti-unclear movement should go far beyond Lanyu or the Yami people, and their final goal is to challenge the existing minority policies. Although policy changes may be deemed necessary, activists seem reluctant to translate their aims into deliverable policies. In a nutshell, EJ advocates are stuck with two insurmountable barriers.

For one thing, the Lanyu case is faced with a nearly insurmountable legal barrier in terms of discriminatory intent. As happened in the US (US Commission on Civil Rights 2003), it is one thing to condemn Tai-power or the government for their failure to meet due process; it is far another to accuse them of deceit or racism. Against such accusations, the government can simply deny (which they did) any wrong doing by insisting that no intentional discrimination was involved in the Lanyu siting decision. Without concrete evidence, the fishery con is only a theory. For another, since no one can possibly in be favour of injustice, by overusing the term EJ can be rendered almost meaningless (Harvey 1999). Taiwanese case-based EJ discourse remains over localised so that it has met severe challenges from different sites of struggle over EJ. A version of EJ is often invoked by these sites against the siting decision. However, it seems no matter where the waste goes the locals can still claim it is injustice by invoking another version of EJ. Since every single relocation decision is still injustice, EJ is to some extent equivalent to stalemate or useless.

In my interview with the Secretary General of the *Green Party Taiwan*, he addressed the tensions inherent in the Lanyu case. In the beginning of our interview, he mentioned: "Lanyu is the leading case of EJ, because [technologically speaking] it [nuclear waste] is unsolvable. Therefore, it is an unjust behaviour to store nuclear waste on Lanyu." At the end of our interview, he however admitted: "Because nuclear waste is unsolvable, it [Lanyu] may not be the best case to address EJ." As a result, Lanyu is the leading EJ case in Taiwan but at the same time it is somehow an "atypical" one. The effects have been somewhat contradictory and destructive. At first, in borrowing from at least two identifiable traditions, environmentalism and

aboriginal rights, the Lanyu people enacted a special hybridised version of EJ that helped them negotiate with the Taiwanese government. This specific EJ argument forced the government to apologise for their violation of EJ. To remedy the wrong siting decision, two councils were set up in tackling the removal issues. Yet, as we have seen, Lanyu still awaits a happy ending. Fighting EJ for so long, the waste remains in Lanyu in part because other chosen sites swiftly copied Lanyu's campaign strategy.

Since not every chosen village is aboriginal, in general it is the "language", rather than the concept, of environmental racism having been widely adopted. By hybridising different conceptions of EJ, different versions of EJ are being employed to defeat each other. The language of EJ itself has soon become an obstacle for Lanyu's anti-nuke movement; a split has emerged and gradually divided anti-nuclear waste activists and environmentalists:

> Our anti-nuclear waste movement is not simply an environmental justice issue. It is about keeping a source of indigenous peoples' livelihood. It is about the government's wrong policies toward minorities and indigenous peoples. **Thinking anti-nuclear waste movement through an environmental justice lens is trying to homogenize this issue, and this view is very one-sided.** It [anti-nuclear waste movement] is not that simple. (Interview: originally in Chinese translated. Emphasis added.)

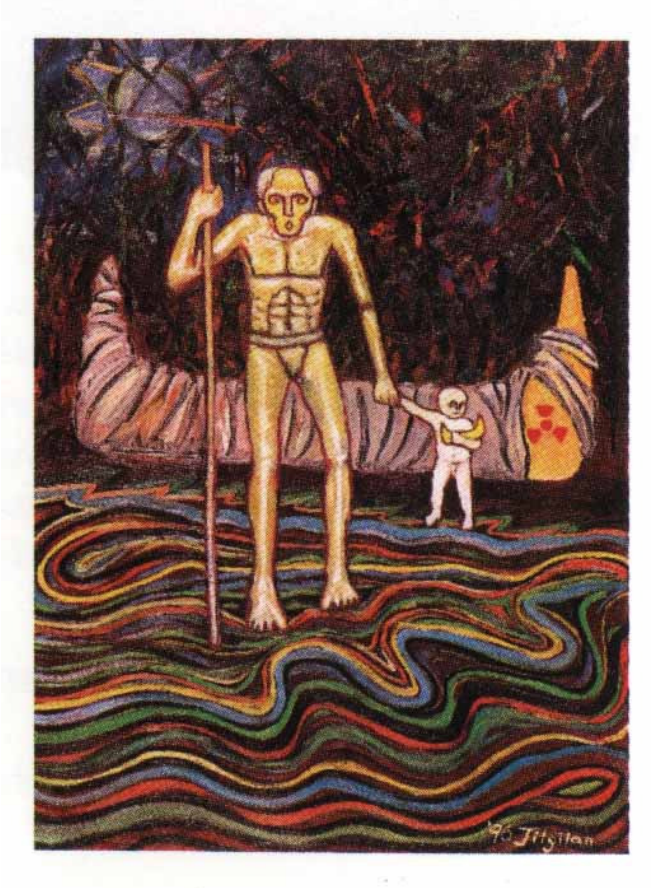
Some of Lanyu's activists deny that their anti-nuclear waste movement has anything to do with EJ. For them, their movement is all about indigenous people's fight for survival; it has less to do with "saving-the-environment". On the other hand, environmentalists have started urging the Yami in Lanyu to assimilate into the mainstream Taiwanese society:

> The indigenous people in Lanyu should think hard, besides the importance of protecting their cultures, whether they want to fit into Taiwan's society so that they can enjoy the same comfort and safe modern life as others. (Jeng, Yang et al. 2002;originally in Chinese, translated by the author)

It seems that environmentalists lack an attempt, perhaps the ability as well, to break

the stalemate. Beyond any doubt, the upshot of the disagreement may lead to a deep rift in the partnership between the EJ movement and aboriginal civil rights movement. In the foreseeable future, the debate may intensify and accelerate within the overall frame on how EJ should be defined.

Figure 6.6: "Where to go" by Siijeilogilan



Source: http://www.taiwanfirstnations.org/#Racial

6.4 National parks: An upside-down EJ case

Now, I turn to the case of national parks. Unlike the "dirty" case on nuclear waste, it may surprise some that national parks have been used to illustrate environmental *injustice* in Taiwan. In the US, charges of environmental injustice normally arise when a dirty industry or facility is sited in or near minority communities. A national park, undoubtedly, is not such a dirty facility, but rather pure and clean one. Thus,

these Taiwanese cases turn on its head the US notion of EJ, at least the Black-White version thereof. Specifically, indigenous peoples often live in the "cleanest" areas – so clean that there is pressure to preserve them from further development – such that their communities are more likely to be selected to host national parks and, for that reason, to be economically underdeveloped. For this reason, the Taiwanese EJ movement is convinced that parks are being imposed, or deliberately sited, on the aboriginal peoples.

6.4.1 A brief history of Taiwan's national parks

The establishment of Taiwan's national parks was deeply influenced by the US. At the end of WWII, a bitter fight between the Communist and Nationalist (KMT) Parties flared up, and in the year of 1949, with American military and economic aid, the defeated KMT-led government was able to retreat to Taiwan. Thanks to ongoing US aid, over the following three decades, Taiwan's economy developed rapidly, making it one of the four Asian Tigers. Meanwhile, there is a less bright side of Taiwan's economic success. Due to exceptionally high growth rates and rapid industrialisation, Taiwan's environment deteriorated quickly. Thus, from the 1970s, the US government and international societies urged the KMT government to protect the island's "natural" environment from over-exploitation. In order to mitigate the international pressures and increase Foreign Currency Reserve through tourism, Taiwan eventually passed the National Park Law in 1972 (Huang 1999; National Park Law (Taiwan) 2007).

In the beginning, this law was very effective at preserving the otherwise deteriorating environment from further exploitation. However, it did not take long for the government to notice that this law had not really taken root in Taiwanese society because, in part, this legislation is not indigenous. Instead, it is a unique hybrid of the Japanese colonial zoning model and, more importantly, the US conservation model. As a transplant from other countries, the law adopted a conservational standard far beyond its time in the local context. With such a high conservational standard, it has caused much conflict between national park authorities and the locals; the locals,

especially indigenous peoples, resent the imposition of national parks[87] and treat these parks as LULUs. Due to strong opposition, the government dropped the proposal for a national park on Lanyu in the mid-80s and reviewed its policy on Magau park recently (Huang 1997; Taipei Times 2000; Huang and Chang 2001). As a result of the controversies, the term of "national park" in Taiwan has almost become an equivalent for (environmental) racism.

6.4.2 Anti-national park (law) movement and EJ

In the anti-national-park (law) movement, the key element is EJ. Aboriginal activists describe these parks and the national park law as an evil institution deliberately targeting and stigmatising indigenous peoples. For this reason the language of EJ has been widely used in the anti-national-park campaigns to provide slogans to combat the biases from the majority of Taiwanese (Huang 1999; Chi 2001; Hsueh, Lee et al. 2002). The reasoning behind the EJ argument can be categorised as both substantive and procedural. Procedurally, most arguments focus on issues of public engagement. It is considered to violate EJ principles because locals were not consulted when the national parks were built:

> "Environmental justice" is related to not only the issues that damage the eco [system] and the environment, but those "nature reserves" and "national parks" as well, which generates from the viewpoint of conservation ….[T]he current [Taiwanese] National Park Law has not involved the local voices into the siting process and it does not protect the interests of the locals. All of these violate the principle of fairness that environmental justice pursues. (Sun 2009; originally in Chinese, translated by the author)

For this reason, EJ scholars and activists severely criticise the National Park Law and consider it a perpetrator of racially motivated injustice (Huang 1999; Yang and Huang 2009). Some EJ proponents single out specific articles of the law as particularly symbolic of discrimination. For instance, in Article 6, the law stipulates

[87] Here there is a question about whether this conflict is actually a matter of environmental justice or it is another form of (in)justice. In fact, this element of ambiguity in the Taiwanese EJ thesis is the very thing that I want to challenge. I argue that under the umbrella term of EJ, in effect different versions of EJ are discussed. See below.

three criteria for the selection of parks; it stipulates that the government should protect the "natural" heritage, pre-historical/historical sites, and recreation resources. From its wording it is evident that "people(s)" are left out of the criteria, many argue that indigenous "people" are treated as if of secondary importance, or entirely unimportant; thus the voices of local residents go unheard in the process of establishing parks.

Substantially, on the other hand, two dimensions are central: the distribution of these parks and the burdens that parks impose on local residents. Generally, it is argued that the social and environmental "bads" -- here including the costs of conservation -- are unfairly imposed onto the weakest social groups, i.e. indigenous peoples. According to Article 13, some activities, including fishing, hunting and controlled burns for the cultivation of land, are banned without exception. Sometimes indigenous peoples pursue these activities to maintain tribal rituals, that too are not allowed under the current law. Thus, most EJ advocates and indigenous civil rights activists criticised the parks as designed to serve as leisure facilities for the convenience of the urban middle class. It is implied, as in Article 6, that middle class's need for leisure areas is deemed more important than the livelihood of aboriginals. While the urban rich are free to enjoy the parks, it is the poor and the most vulnerable who shoulder the costs:

> These costs are evident in the following items: the ban on mining, fishing, hunting and gathering wild flora; restrictions on the transformation of land surface; and restrictions on all construction works. (Chi 2001:147)

It is worth noting that, similar to the Lanyu nuclear case, the US thesis and its measures of EJ are deeply entrenched within the Taiwanese anti-national-park campaigns. On the one hand, indigenous peoples are considered to be "deliberately" targeted by the government through the procedures demarcating the parks. Briefly, it is argued that when drawing the boundaries of these parks, the government deliberately, partially motivated by racial considerations, demarcated hunting grounds and homelands as parklands. Since the way these boundaries are drawn is racially biased, the behaviour of boundary-drawing is sometimes treated as a way of

"bullying" indigenous peoples (Chi and Wang 1998; Chi 2001; Yang and Huang 2009).

On the other hand, the thesis of distributive justice, distribution of environmental "risks", was introduced into most parks-versus-indigenous-rights literature:

> From the standpoint of nature and heritage protection, the establishment of national parks has made some very positive contributions. However, nowadays, Yushan, Taroko, and Sheipa national parks – that is, three of six [currently there are eight[88]] national parks in Taiwan – are located in areas traditionally claimed by indigenous peoples. Because no consensus was reached when these parks were founded, conflicts between indigenous peoples and national parks have lasted over the past ten years (Chi and Wang 1998: translated by the author).[89]

> Currently, there are 6 national parks [there are eight now] established in Taiwan; with another 2 subject to further discussion, and a final one (Makau National Park) now under planning. Amongst there nine related national parks, more than half of them are concerned with the living space of aboriginal tribes. (Huang and Chang 2001:1)

6.4.3 A new way of looking at the old numbers: Siting national parks "onto" the aborigines?

Almost all national-park related EJ literature (Chi and Wang 1998; Lin 2001; Tseng 2007; Yang and Huang 2009) used the above-mentioned argument to "prove" that national parks are more likely to be located in the lands of indigenous peoples so that the parks themselves are also instances of injustice. As the literature continues to grow, two critical shortcomings have recently been addressed. The first deals with specific methodological shortcomings in the ways in which national parks are "assigned" to indigenous peoples. The second blind spot concerns the evidence of

[88] The eighth national park, Taijiang National Park, was established in October 2009. This newly created national park is located in the southwest of Taiwan; most of the nearby residents are Hans/Chinese. Therefore, currently three out of eight national parks are located in the living space of aboriginal tribes. See: (Council of Construction and Planning Agency 2009).

[89] Similar argument from Chi can be found in some English pieces as well: "Since the 1980s, the government has established six parks on Taiwan, of which three high-altitude parks are located in the historic homelands and hunting grounds of the indigenous Taroko, Tayal, and Bunun tribes."(Chi 2001:147)

unequal distribution.

Regarding the methodological problems, it does not take long for one to notice that in the national park case EJ, especially in the above Chi and Wang quote, was closely following the Americans' lead. As we can see, by categorising EJ into procedural and substantial justices, the definition of EJ was purely American. Procedurally, a national park is considered unjust if it was built despite a lack of communication and consensus; substantially, a park is unjust if the burdens it imposes are disproportionately distributed. Chi and Wang did not use convoluted mathematical models to calculate the spatial distribution of these parks; nonetheless, their purport was evident and very similar to that of American EJ advocates. They attempted to "prove" that most of the national parks, 3 out of 6, are located on the land of indigenous peoples. Since indigenous peoples make up only 2% of Taiwan's population, they feel it is "unjust" to be compelled to shoulder the "burdens" of national parks.

This argument, without a doubt, is weak, and invites opposition from all sides. First, using the aforesaid argument, i.e. the thesis of distributive justice, the government can easily bypass this so-called unequal distribution. On the one hand, the number of national parks has been increasing over the past decades. Thus, the ratio of unequal distribution is gradually dropping from 3/5 to the recent 3/8. Although still high, these figures show a significant decrease. Since the government can easily exclude indigenous homelands (see the Sheipa case below) when creating new parks, the percentage is likely to continue decreasing in the future.

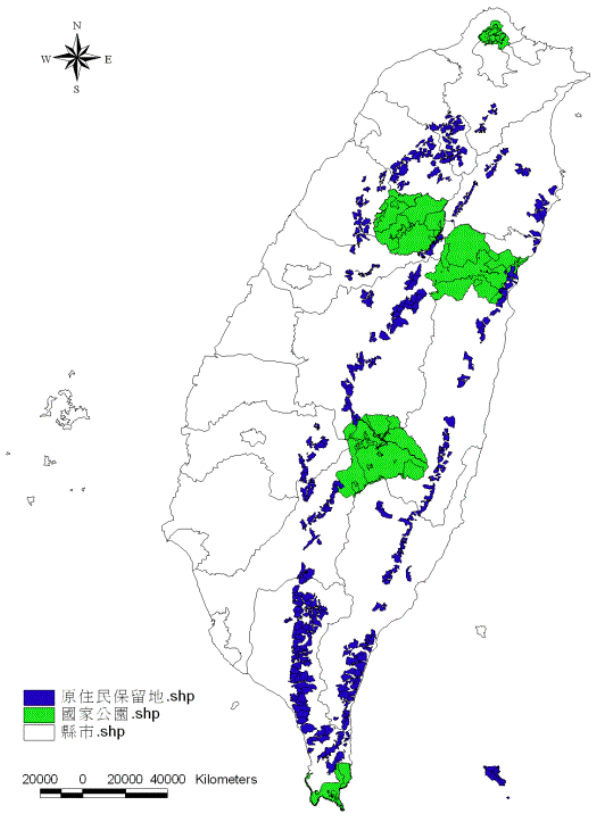
This argument also opens up a debate over how to define an aboriginal community and the boundaries of their "homelands". From the above quote, people may get an impression, almost mistakenly, that aboriginal communities largely overlap with the parks. After all, it is argued that 50% of the parks are *located* in indigenous communities. In the literature, most EJ activists used two terms, historical homelands and hunting grounds, to describe how national parks overlap with aboriginal lands. However, they do not provide a clear definition on where and what these lands are.

The debate continues. In order to create a "New Partnership" with aboriginals, the previous DPP (Democratic Progressive Party) government had promised to give back more land and more autonomous powers to aborigines. In the future, every tribe was to enjoy "tribal sovereignty" over their lands (Hsiao and Hsiao 2003; Zhang 2008). However, such promises have yet to be realized in legislation, and it is still uncertain how extensive the lands are and how many autonomous powers the aborigines will be given. The lack of a clear definition invites serious confusions because, historically speaking, as some indigenous activists insist, the "whole" of Taiwan belongs to indigenous peoples:

> Indigenous peoples came to this land [Taiwan] thousands of years before the Han people who were from the main-land China [about 400 years ago], let alone those 30-year-old national parks? (Hsiao and Hsiao 2003; originally in Chinese; translated by the author)

One means of looking at this issue, perhaps the most common way, is to use the legal concept of Aboriginal Reserves. Consulting a map, then we can visualise the amount of land devoted to national parks and aboriginal reserves.

Figure 6.7: A map of national parks and aboriginal reserves



Source: (Lin 2002)[90]

Table 6.1: The percentage between national parks and Aboriginal Reserves

National Parks	The area of parks (hectares)	Aboriginal Reserves (hectares)	Percentage
Yushan	105,490	1,438	1.36%
Taroko	92,000	2,227	2.42%
Sheipa	76,850	11	0.01%
Total	274,340	3,676	1.34%

Source:(Yang and Huang 2009)

[90] The purple represents Aboriginal Reserves; the green are the onshore national parks; the white are the boundaries of countries.

Arguably, the map and numbers tell us a completely different story, and one may feel slightly tentative in assessing whether or not the three high-altitude parks are, as Chi argues, "on" indigenous homelands. The answer to this question is largely dependent on how one interprets these numbers and which threshold one chooses. Arguably, it is true that there is some overlap, but it is very difficult for anyone to say whether or not these parks are "on" the indigenous homelands/Aboriginal Reserves based on the 0.01 or 2.42 overlap.

6.4.4 The Sheipa debate: Excluding aboriginal homelands from the proposal of Sheipa

In the case of Sheipa, it is especially hard to make such distinctions regarding aboriginal homelands, not least because indigenous communities constitute only 0.01% of the area of the park, but also because of the history behind this number. Having dealt with opposition from indigenous peoples, when setting up Sheipa national park the government deliberately *excluded*, not included, the Tayals' land from the park (Huang 1997; Chi and Wang 1998; Huang and Chang 2001). As a result, at least in the Sheipa case, one can hardly argue that the placement of this park "deliberately" targeted indigenous peoples.

It is argued, by one of my interviewees, that even though the park is not sited on your "head", you will still be affected by it. He relates the following story. In 2001, aboriginals from Hsinchu County were protesting against a proposed incinerator in their backyard. The government intended to build an incinerator to tackle garbage produced by visitors to Sheipa national park. According to the National Park Law and other regulations, an incinerator cannot be sited within the borders of a national park: thus the proposed incinerator was to be sited adjacent to the park.

The residents living near the site argued that it was not the responsibility of locals to deal with the garbage, particularly given that they produce much less garbage than the tourists. Again, EJ was deployed in the rhetoric, as in this news release:

> It [the siting behaviour] violates the principles of environmental justice if local Aboriginal tribes have to be responsible for managing waste generated by visitors to Shei-Pa National Park…(Taipei Times 2001)

In this case, the tribe is affected by the park and associated regulations even though neither the tribe nor the incinerator is within the park. However, again, it is difficult to argue that authorities were "targeting" the aboriginals. Considering the intention of deliberate target, the issue of national parks may fall into a new "chicken-or-egg" debate (Bullard 1994d; Mohai, Pellow et al. 2009). As happened in the US, people may ask "Which came first?" (Indigenous peoples or the parks) Most of my aboriginal interviewees stated that instead of being forced to give up eating wild hog,[91] the latecomer, i.e. national parks, should respect our culture. After all, *they* were here first.

6.4.5 A deadlock: EJ vs. EJ

Unlike the US version of the debate, which came first? (Blacks or facilities), in these cases the indigenous peoples *always* came first. At first sight it seems a winning argument. Nonetheless, environmentalists are strongly opposed to the argument that prior habitation entitles residents to bend the law and continue hunting. One of the most famous figures strongly opposed to opening the door to hunting in national parks is Chang, Lung-Cheng (2001). Cheng, who later served as the director of TEPA, is the very person who helped create the first national park in Taiwan. He argues that it is important to protect tribal traditions, however it is equally, if not more, important to protect the environment for the generations to come. Additionally, it is impractical for indigenous peoples to continue to think of using traditional means of protecting their traditions. As a result, no matter whether or not hunting is a traditional activity, he stresses, it should *not* be allowed in a national park. Most environmentalist and officers from national park administration office share Chang's

[91] A very similar argument can be found in the website of an aboriginal legislator. It is unfair, she argued, to force indigenous peoples to change their traditional dishes and eat Han's food instead. See: http://www.abohome.org.tw/index.php?option=com_content&view=article&id=538:records-record16-538&catid=47:record15&Itemid=246

standpoint:

> In order to protect environmental justice for our local natural environment [protecting Mother Nature on the grounds of EJ; some may call this version of EJ "ecological" justice], since 1988 the locals have launched a series of campaigns for forest protection. For the first time in history, Taiwanese started its saving juniper movement… Eventually, the natural juniper forest is saved by the total ban on logging. (Chen 2003; originally in Chinese, translated by the author)

One easily notices that in the national-park debate, an EJ vs. EJ dilemma arises. Should we protect the most vulnerable sector of the current population or protect the environment for future generations? With both sides imagining themselves as being on the side of "justice" and invoking the principles of EJ, making compromises is seen as a betrayal to one's principles and making an accommodation with injustice.

As a result, the two sides have been deadlocked in what seems a losing game for both. For those who consider indigenous rights come first, logically it is harder for them to assert that these parks were deliberately sited where aboriginals live. It seems more justifiable that these parks were sited as they were because the lands are closer to "nature", not because of the presence of indigenous peoples. It is hard for one to suggest otherwise. For the later, i.e. those who suggest that the future generations to be more important, it seems equally strange for them to argue that it is acceptable to force indigenous peoples to change their traditions in the service of environmental protection. At this stage, the deadlock seems likely to continue.

6.5 The institutionalisation of EJ: Why is the future of EJ still uncertain?

6.5.1 President Ma's policy: A promise of EJ

During the election campaign in 2008, the two major parties in Taiwan reached an unprecedented consensus. Both candidates in the election concurred on upholding the principle of EJ. By making EJ the top priority of their environmental policies, each of the candidates promised to achieve EJ within the term of his potential presidency.

Candidate Ma, later the 12th President, was especially keen on EJ.

Ma's whole environmental policy, also known as the "Sustainable Taiwan" whitepaper (Ma 2008), was elaborated from an EJ perspective. In this whitepaper, the concept and terms of EJ were not only adopted but also prioritised. For one thing, EJ was highlighted as the first, and perhaps most significant issue under his authority. In the meantime, when outlining the direction of future policies, EJ was also given a whole new standpoint on Sustainable Taiwan. "A better Taiwan", according to Ma, is achievable if consideration is given to both sides of the debates over environmental protection, economic development and social justice. To that end, the government must popularise EJ and further materialise it through freedom of information and public engagement. For the implementation of EJ, his chief policy will aim to broaden the existent hearing system, and public hearing processes will be a *must* in all controversial development projects in which there is a conflict between the environment and development. After paving the way for much-needed "mutual trust",[92] EJ can ultimately be achieved, Ma believes (Ma 2008).

After opening up a space for EJ in policy-making, the decision over the rhetoric of government is certain to affect the trajectory of environmental policy in general for some time to come. Yet, a blind spot can be identified within this whitepaper. As one can see, EJ was used very loosely and in most cases refers only to "sufficient information" and "meaningful participation". That means, Ma's EJ policy is limited to procedural justice, and distributive issues are not covered. As we all know from the US experience, the problem of environmental injustice is not going to be solved simply by redistributing risks. It is however equally true that EJ cannot be solved through procedural justice alone. For instance, in a typical PIMBY case, once the government provides sufficient information and meaningful participation, procedural justice is often considered severed. The problem with that is, as seen in the Taiwanese nuclear waste case, indigenous tribes are more likely to make a PIMBY claim. In the end, minorities still shoulder a disproportionate share of environmental risks. Thus, there will be a danger if one overlooks the substantial side of EJ. To

[92] It is ambiguous where the mutual trust should be established. From the context of this text, it seems that the spirit of mutual trust should be established between the government and citizens.

crystallise EJ around procedural perspective not only limits the meaning of EJ but also discourages the achievement of substantial/distributive justice. To this effect, although President Ma has made clear the importance of EJ in his policies, how EJ will be manifested during his term in office is still uncertain.

After taking office, the aforementioned uncertainty turned out to be a real danger. EJ was rendered meaningless, at best, and at worst harmful to the implementation of policy. The new EPA chief reaffirmed Ma's vision on articulating "farsighted and just environmental policies" (TEPA 2008).[93] However, the EPA has brought forward few tangible policies on behalf of the new administration. Since this white paper was only an election campaign manifesto, it is necessary to look back on the previous policies.

6.5.2 Chang's TEPA: The turning point for EJ

In June 2005, Professor Chang, Kow-lung was appointed as the new TEPA minister; His appointment was a turning point for both the TEPA and the EJ movement. As a veteran leader of the Taiwanese environmental movement, Chang was the very person who spurred the government on to establish the TEPA in the late 1980s.

The anti-nuke movement may best exemplify his career. In Taiwan's environmental movement, he is famed for his unwavering advocacy of a nuclear-free homeland. As a result, he was dubbed "the godfather of the anti-nuke movement". In Chang's inauguration speech, he reconfirmed that during his term in office, EJ would inform his policy objectives:

> [E]nvironmental rights are a basic human right. Chang hopes to help materialize the concept of environmental justice in the future. To this effect, greater consideration must be given to local environmental loading in all development activities and administrative measures. During his term in office, Chang will uphold the government's ideal of creating a "green silicon island," as well as the

[93] This inauguration speech, entitled "Healthy, sustainable, and protecting Taiwan", adopted exactly the same the title with that of Ma's environmental whitepaper during his campaign.

existing Nuclear Free Homeland policy.[94] (TEPA 2005a:4)

Under Chang's TEPA, EJ arguably reached a new peak. In celebrating its 20th birthday, the TEPA published a 2007 whitepaper, "Upholding environmental justice, achieving sustainable Taiwan" (TEPA 2007a), to review its achievements and, more importantly, to prospect for future policies. Originating from its previous namesake manifesto in the 2004 presidential campaign (Liu 2004), this 2007 white paper reconfirmed that EJ would be a high priority in the government, at least for the TEPA. EJ, however, has grown increasingly vague.

In the formulation of this 2007 white paper, the key element, as seen in its slogan, was EJ. Given that the central government adheres to EJ, local governments have quickly followed suit. Suddenly, from central to local authorities, EJ was being widely applied in formulating policy. However, as Harvey (1999) has observed, since it is difficult not to approve of "justice", with the spread and increasing use of the term, the core principles became obscured.

Policy adoption is necessarily an interplay of power and politics, though it must be broad-based, acceptable to the public and, most of all, principled. By relying ever more on rhetorical devices, both EJ opponents and advocates obscured the principles at its core. As it is, EJ has been used to affix a seal of approval to almost any environmental campaign. In a bike campaign for stopping climate change:

> Other participants who rode their bicycles in the parade claimed their right to the road, saying that the increasing number of bicycle commuters needed "environmental justice." (China Post 2008)

The government has benefited from the ambiguity of EJ's definition. In the early stage of institutionalisation, EJ was defined along a traditional line similar to the

[94] It is worth mentioning that although this quote here is from the Taiwanese EPA's official magazine, it is only a rough translation. It is a tone-down version of its Chinese/original counterpart. Some nuances were lost in translation. For one thing, in the English version it says that Chang attempts to *create* a "green silicon island". Referring to the original speech, a more appropriate translation however should be "Green is more important than silicon island". For another, in the original speech, the term *EJ* was mentioned several times. It however had not been used with "green silicon island". It is also noteworthy that in the Chinese version he put the English term "environmental justice" in his speech. Clearly, it implies that the concept of EJ was adopted from English (TEPA 2005a).

definition used in the US, with the most vulnerable members of society and their human rights at the very centre of government policies. In Taiwan Agenda 21, it is argued:

> Furthermore, along with the aforementioned consideration of "group" fairness and justice for disadvantaged groups and future generations, it is also vital not to neglect the principles of environmental justice and fairness for the individual, as embodied in the concept of "environmental human rights" floated and advocated internationally in recent years. Based on the above, the pursuit of fairness and justice in a sustainable society may be focused on the following three main strategic objectives: 1) protecting disadvantaged ethnic minorities and groups; 2) paying close attention to the well-being of future generations; and 3) protecting environmental human rights…. The basic thinking on "environmental justice" also tells us that the living domains of the most disadvantaged groups in society are usually the first places where the natural environment is damaged and polluted, and that this eventually leads to the continuous spread of environmental damage. In Taiwan's present-day society, the most disadvantaged members of the population are not only those living in economically and culturally disadvantaged communities (including poor and decayed urban districts as well as many remote areas), but also include indigenous peoples, children, women and senior citizens…(National Council for Sustainable Development (Taiwan) 2004)

As time passed, a broader definition has gradually been introduced and the thesis of EJ has more become deeply entrenched within many segments of policies. Now, there is a tendency to believe that as long as the issue is environment-related, it can be interpreted as being an EJ issue. In this way, one can even assert that the gist of EJ has already been infused into the Taiwanese constitution as a theme that cuts across society, albeit one aimed at specific environmental issues, broadly defined and intersecting with policies on economy:

> Environmental and ecological protection shall be given equal consideration with economic and technological development.(Additional Articles of the Constitution of the Republic of China (Taiwan) 2005)

> Looking back on the conflict between the growth-centered and ecology-centered advocates, we see that people in this country has finally managed to find a way out of the deadlock….Growth has its limitations, and such concepts as sustainable development, harmony among ethnic groups, and environmental rights [the term, environmental justice, was used in the Chinese version] have now become new choices of life….The concept of a

> "Nuclear-Free Homeland" is a concrete product of this mental transformation process, and it represents a commendable attempt by the nation's people to usher mankind into a new era of life. (Executive Yuan (Taiwan Government) Nuclear-Free Homeland Commission 2003. The booklet is in both English and Chinese. Differences can be found between these two versions.)

After the shifts in meaning, EJ has become more eclectic: perhaps to the point of meaninglessness. This is particularly the case, when it is deployed in local governmental campaigns, as authorities tend to render it harmless. The effects have been somewhat contradictory.

The aforementioned 2007 EPA white paper shows exactly this contradiction. It looks back on TEPA's achievements in clamping down on pollution and waste. Yet, aside from using the term in its title, this whole white paper says nothing about why controlling pollution has anything to do with "EJ". EJ, it appears, has become a code word for "environmental protection" (see also: Office of the President (Taiwan) 2007). It can refer to the enforcement of anti-waste dumping (Changhua County Government 2006), the implementation of environmental impact assessment (TEPA 2007b), or even compensation for reciprocal trans-county waste transportation (EJ Fees/tax) (TEPA 2005b). These policies are closely aligned with the goals of the authorities, but render EJ meaningless.

It is not difficult to understand why this broader definition has been adopted by the government. Although the government is desperate for a statutory hook, they are unwilling to push for new legislation, as the US has done. As a result, TEPA turned to the most plausible available prospect: accepting EJ, but only rhetorically. This policy strategy, however, is doomed from the start to be disappointing because the policy fails to measure up to activists' expectations. With such a broad definition, despite good intentions, the state of EJ is unlikely to improve. Thus, EJ activists can never concur with the government on the utility of deploying EJ for rhetorical advantage.

6.6 Section conclusion: What constitutes EJ in Taiwan?

Looking back over the history of EJ in Taiwan, it is more than clear that as with its US counterpart, the success of Taiwanese EJ movement lies in the meeting of racial -- especially aboriginal -- issues, and environment concerns. On the one hand, the rhetoric of EJ provided political momentum and opportunities for aboriginals; on the other hand through building this coalitional frame, the coalition's success also contributed to EJ movement's victory. Behind these success stories, some less bright spots however have not been painted into the triumphal picture.

Firstly, it is problematic to treat all forms of EJ as one. In Taiwan, there was a strong tendency to racialise EJ issues and the literature adopted a case-based strategy. Lanyu epitomises this very problem. Activists' key argument regarding the Lanyu case is that the nuclear waste facility was sited on the land of indigenous peoples, resulting in a racial difference in the distribution of nuclear risks. In fact Lanyu case says nothing about how nuclear waste is "unequally" distributed across racial groups. With this vulnerability, critics can easily sidestep accusation of racism by recasting Lanyu as an example of NIMBY. This NIMBY argument blurs the boundary between EJ and other concepts and a second question arises: How are these NIMBY cases relevant to EJ? Put it another way, are "case-based EJ" and "NIMBY" the same thing? Or, they are in fact different modes of classification.

On the one side, casting EJ into a case-based frame assumes that any LULU or NIMBY facility must be manifestly unjust or unjustifiable. Also, this interpretation tends to take for granted that EJ issues are essentially regarded as "incidents" so that they should be dealt with on a case-by-case basis. In fact, it is tautological to accuse a LULU of increasing the burden on locals because residents living close to such a facility must shoulder higher burdens and risks than others, or this facility would not provoke such a NIMBY reaction. For this reason, the Lanyu case leaves room for interpretation whether or not the reaction to this facility should be labelled as NIMBY or an outcry against environmental injustice/racism. On the other side, people did not seem to notice that how a case is labelled is purely a political matter. The government called a case NIMBY because the proposed facility is considered necessary so that the public interests can and should always override the private

rights/interests. Likewise, EJ advocates call a case EJ because they assume that its "injustice" is manifest. Both sides sought to associate a case with different justice practices to make judgements about a bigger justice case.

One thing is for sure however: the fewer questions asked of the nature of EJ, the more likely it will yield some sense of injustice simply on the basis that a facility was sited on/near the indigenous homelands even if the treatments are in fact equivalent[95]. Researchers, without articulating the relationship between NIMBYism and EJ, lead readers and the public to assume that a specific NIMBY case in itself is an EJ case and certain racial groups have a special predisposition to be targeted by the government or the industries. If inequitable distribution is a key element of EJ, individual cases of injustice seem unable to help identify the pattern of distribution that activists are keen to find. Although NIMBY is often used as a proxy for EJ in Taiwan, "the distribution of risks" is important in its own right because EJ may sink deep into the mire of conflicts surrounding NIMBYism.

Thirdly, under this one-dimensioned strategy a broader and systematic picture is still to be painted on the issue of how serious environmental problems afflict low-income and minorities. These problems appear overwhelmingly to be quality-of-life problems. Consequently, it may be detrimental to the interests of the indigenous communities because a one-dimensional strategy undermines attention to more important sources of poor health (Foreman Jr 2003). This distraction accelerates the split between the environmentalists and civil rights activists. At the early stage, EJ movement has successfully opened up possibilities to effectively align environmentalism with civil/aboriginal rights paradigm. By including a broader range of injustice, the marginalised can be involved into the EJ frame. Nevertheless, using the language of justice can easily slip into a stalemate where EJ against EJ. Once it happens that different types of EJ are used against each other, the public may conclude that EJ brought more questions than answers. Therefore, things are getting worse not better. Take Lanyu for instance, it seems that nuclear waste drags the Taiwanese EJ movement into an unsolvable situation because no matter where the

[95] It is not saying that Lanyu residents, comparing with some main-islanders, are not shouldering higher nuclear risks; it is just saying that Lanyu may in fact have nothing to do with racism.

waste goes “injustice” remains. Suddenly, EJ activists found themselves being blamed for hindering the removal procedure. This will split the coalition and cause activists to step aside from each other.

Fourthly, after being overused, the meaning of EJ has gradually changed. It is worth asking: Have we shifted ground so completely that we are no longer talking about the same phenomenon? (Huang and Hwang 2009c) I do not think we are. Under the umbrella term of EJ people do not seem to notice that different EJs were discussed. A dissertation such as this is not concerned with the moral rightness of any particular party in this ongoing debate. It does however need to underline the fact that this kind of controversy of comparing oranges to apples is likely to become more common rather than less. Even if we agree that the approach of shifting meaning of EJ itself is legitimate and justifiable, apparently we need to know a great deal more about the elusive and changing links among EJ, racism, civil rights and, more importantly, NIMBYism.

Finally, institutionalisation is a problem which invites all above-mentioned pitfalls. If the goal of EJ is to make a shift from rhetoric into deliverable targets and actions, the current debate needs to move forward setting up an achievable framework. Having seen above, insisting an implausible framework can lead to a further rift between EJ and aboriginal activists. Just as Lanyu case tells us nothing specific about the distribution of nuclear waste, EJ in the field of policy-making provides limited guidance to local governments when dealing with a specific EJ case.

EJ is a movement that is struggling hard to come to terms with a rapidly changing situation. Before institutionalisation, EJ groups are more likely to receive sympathetic attention from the public. Once EJ is institutionalised, there comes a danger of fragmentation and marginalisation. In Taiwan EJ movement has shown both symptoms. Since no matter what the government does, activists still accused them of racism and injustice. It turns out that the Taiwanese government gradually loses its attempt to treat EJ seriously. Without an achievable goal EJ was either too narrowly or too broadly defined to suit the convenience of the government. It is too

narrow when we imposed a specific, say racial or case-based, definition onto EJ, since we are restricting ourselves, often unnecessarily, to a relatively narrow set of EJ concerns. It is too broad if we think that EJ can mean anything as long as the issue can be regarded as an environmental one. Reluctance to impose proper criteria can cause serious problems, as the government seems more than happy to play the meaning-shaping game to define and redefine EJ to make it harmless. As happened before, most of the environmental cases ended up becoming an ineffective preamble in a law. It is more likely to be the case if the meaning of a concept is inattentively defined. Without a practical definition and object, there is a good chance that EJ turns out to be written into policies or laws, but only nominally. That means, the government does not have to do anything except saying that they care about EJ.

In the foreseeable future, the debate may intensify and accelerate within the overall frame on how EJ should be defined. While scoring some major victory in gaining access to the policy making process, environmentalists are still powerless, sometimes reluctant, to translate their intentions into effective policy. Their reluctance can easily preclude general discussion on how to materialise EJ at a policy level. It seems that activists should prepare a way for shift of thinking. And this will be the topic in my concluding chapter.

7 Conclusion

7.1 Introduction

I have scrutinised the history of EJ, the process of its shaping and continual reshaping, and the adoption of EJ in Taiwan. By so doing, I have made it clear that both the phenomenon of environmental injustice, and the discourses that describe and the measures that gauge it, are a dynamic condensation of power relations/struggle. Along the way, I have sought to demonstrate how these events can be understood and analysed using a number of theoretical tools, especially through a constructionist lens. In this final chapter, I draw together all these threads to form a more comprehensive story and provide a theoretically consistent fabric.

To do this, I propose to modify Sui's (1996) analytical tools, which contextualise geographic information system (GIS) at five different, but interrelated, dimensions: ontology (what exists), epistemology (how we know what we know), methodology (how analysis is conducted), ethics (the rightness/wrongness of human conducts) and politics (power struggles). In Sui's position paper, he attempted to develop a critical theory of GIS, which could link the GIS technology with society. Despite his insightful analysis, at only five pages his paper could not offer sufficient detail to consolidate his arguments. I seek to extend his interpretive framework and then derive new insights from these analytical tools. Specifically, with the help of this framework I further (re)contextualise what we called EJ into broader intellectual and social dimensions. After so doing, new directions can be provided to further our understanding of the relationship between knowledge-making, power struggles and technologies.

To begin with, I apply Sui's analytical tools to investigating the way EJ is constructed. I will then move into a discussion of the theory of EJ, showing how the insights of this thesis can both deepen and challenge our current understanding of EJ. In this discussion, I do not attempt to supply a point-by-point critique of existing

theories; rather, my goal is to outline some common ground which exists between EJ enthusiasts and its critics. Finally, I will sketch my view of the future of EJ. In so doing, I will also draw some tentative conclusions about how the current positivist EJ approach could benefit from my research.

7.2 Re-contextualising EJ

7.2.1 Ontology: What exists?

In previous chapters, I have made it clear that the way we define EJ is really dependent on what EJ is; and what EJ is is closely related to its ontology, which depends on how we define it. Although it looks more like "a circular definition", it is striking that most researchers did not notice that they were using a single set of definitions and hypotheses to test for the existence of multiple layers of EJ. As a result, what EJ is varies according to the definitions and hypotheses we employ (Phillips and Sexton 1999; Downey 2005; Schuurman 2005). Certainly, a question like this lies in the domain of ontology.

Ontology tackles the fundamental question of what exists, what something really is, and its fundamental essence; therefore, ontology usually refers to the theory of existence. To computer-related researchers (GISers or risk analysts), ontology is a formally defined set of objects in which all the potential relationships among these objects are defined accordingly (Schuurman 2004:31). For example, in order to represent objects (e.g. households and landfills), researchers need a method of encoding the objects themselves (e.g. representing landfills as dots) and the relationships between them. In this light, the rules of encoding and the relationships between these objects are as important as, if not more important than, the objects themselves. By addressing different ontological questions, researchers determine what can be known and what are accepted as "facts". To a large extent, the essence of being is deeply embedded in researchers' beliefs (Sui 1994; 1996; Schuurman 2000; 2004; 2005).

Ontological issues in the EJ debates revolve around defining researchers' ideas and beliefs, then representing them in media such as maps or numerical data. As we can see, EJ researchers use different encoding systems to construct their ontologies. In more technical terms, the ontology of EJ lies in the terrain of data modelling as researchers abstract the infinite complexity of reality into finite measurement. This very model subsequently determines the scope of research to answer the range of EJ questions (Sui 1994; Phillips and Sexton 1999; Downey 2005). Concretely, in the spatial analysis of EJ researchers principally agree that reality can be measured through variables such as location (where), features (who/what), spatial association (how) and time (when) (Sui 1996; Batty 2005; Schuurman 2005; Frumkin 2006). These variables predominate most of our discussions for the reason that most researchers consider them as the rational basis for describing geographical and social phenomena. The problem with this is, people rarely ask whether or not these variables are the most appropriate for representing the multiple forms of social relationships or the multi-layer phenomena of EJ.

Again, take EJ spatial research. In terms of location, researchers normally transform geographical reality into points (zero dimensions), lines (one dimension), polygons/circles (two dimensions), and volumes (three dimensions). Likewise, features are represented according to given classifications and categories such as race, socio-economic status or TRI dataset. Spatial associations are translated into proximity and adjacency, which assume that risk and location must be linked in some way (i.e. spatial autocorrelation (Schuurman 2004:38)). Even time is abstracted into a one-dimensional element so that researchers can compare various datasets over time (Sui 1996; Batty 2005; Schuurman 2005; Frumkin 2006). By making such ontological assumptions, these studies simplify the world into a digital format. Nevertheless, people often overlook the social and cultural aspects of space and relationships built into their data modelling. For example, racism in this approach has been translated into a relationship (proximity) between dots (facilities) and polygons (communities/neighbourhoods). Needless to say, racism is far more complicated than such a simple spatial relationship. Using this ontology to describe the world, we inevitably create an oversimplified and thus distorted view of racism.

If one goes through EPA's four-step risk assessment procedure, similar hypotheses can be identified in risk-based studies as well. From an ontological point of view, risk analysts share a covert belief that reality can be represented in terms of vulnerability (who), toxicity (which/how much), association (how), and exposure time (how long). As expected, none of these factors are straightforward to define. For example, the definition of toxicity depends on which chemicals we treat as hazardous, which in turn reflects our perception of what is *at risk*. In the US context, environmental causes of cancer attracted more attention than any other diseases. As people care about, almost obsess on, cancer, researchers have invested considerable time and money in carcinogen surveys (Jasanoff 2009). In turn, these carcinogen studies not only dominated the EJ study but also reaffirmed the exceptional toxic control policy. For another example, the principle of "equal doses" is often assumed in risk assessment, meaning that equal doses of toxicity causes equal harm to *everyone*. The problem is, the human body itself is not physiologically equal, neither is the social context for people. Whilst some have access to resources, healthcare, healthy food and so on, others do not (Walker 2009). The assumption of equal doses is invalid.

Likewise, vulnerability is grouped and labelled very much according to different classification and categorisation. In order to overcome the so-called "average-White-male-reference-man" myth (Kuehn 1996; Epstein 2004; 2007:Chpter 10), EJ research concentrates on different attributes among groups of people, such as age, race, and gender. When using these attributes, to some extent we are also limiting ourselves to predefined classifications of who is at risk. Associations are represented in terms of rigid statistical models, like the 95% rule. Surely, statistics is *not* the only way of representing risk and, as I have presented, the 95% rule is itself a trade-off between different versions of justice (scientific certainty vs. protection). Finally, since people's behaviours (e.g. pica behaviour) can be unpredictable, the estimated exposure time is only a rough guess from scientists.

To take a step further, even the term *risk* itself implies a harmless, sometimes even

beneficial, worldview between human and environment (Sui 1994; Montague 2004; Jasanoff 2009). Under this language, risk is considered the exception, not the rule. For this reason, using the term risk alone can create a barrier against radical change which however lies at the very centre of EJ struggles. As we have seen, what people select to guard is interwoven with their value judgements in which gender, race, and class have to be understood as the basis upon which risk is constructed. In other words, people's understanding of what is at risk, how best to measure and manage risk, and how to accommodate risk with other important values are socially and culturally shaped. To represent such a multifaceted kaleidoscope through a numerical risk or space model is oversimplified; no wonder critics contend that these assessments hide more than they reveal. To a large extent, EJ researchers are biased toward a particular ontology from the very beginning.

These ontological biases are also embedded in the terminology which we use to address EJ. Researchers commonly refer to a phenomenon called EJ that implies a clearly understood, generic class of behaviours and occurrences, and yet no such concept exists. Justice is automatically assumed to be *good* and is inherently more desirable than injustice. As no one would possibly claim that he/she prefers injustice to justice, each side insists that they are on the side of justice. As seen in the literature, the concept of EJ is often used, but without careful conceptualisation. Given the inherent conflicted nature of EJ, it is not surprising that notions of the concept itself are slippery. It seems that most researchers have accepted a pre-given mentality of what EJ is, with varied consequences. For instance, in order to understand people's attitudes toward EJ, Taiwanese researchers conducted a survey and asked questions like (Hsiao 2002; Chi and Hsiao 2003):

- Do you think EJ is a part of our basic human rights?
- Do you support the call to lift the hunting ban in national parks?

Predictably, 95% of their respondents support the first claim. After all, it is almost unthinkable that EJ is not in some way intertwined with human rights. Answers to the second question were more divided. The authors then quote this contradiction as

proof that most people do not understand the *real meaning* of EJ. They then concluded that more EJ education is needed. From this case, it is obvious that researchers use a pre-given definition, i.e. indigenous peoples' hunting rights constitute EJ, to exclude people's hesitation toward this claim, rather than accept it as another version which equally represents EJ.

A research study like this is dismissing a definition of EJ simply because it does not meet researchers' criteria of what is important and interesting. Clearly, this case's researchers are restricting themselves to a predefined version of EJ, which implies that some EJ concerns, hunting rights in this case, are more important than others, such as the discriminatory intent of EJ. Here, perhaps the fundamental question is how broad a definition of environment (or justice) should one employ? There is not a single answer to this question. Take the term *environment*. A narrow definition would refer to the natural environment and concentrate on distinct elements, such as air, water and soil; a broader definition would also include the surrounding conditions, as in the urban environment (Barnett 2001). As it incorporates the built environment, the latter definitely demonstrates a different EJ picture from the former. In terms of justice, the meanings attached to some basic terms, even *justice* itself, are known to vary across time and place. In turn, these diverse meanings shape and then reaffirm divergent perceptions of what is at risk and what is in most urgent need of protection. For instance, under the scheme of environmental equity, only minimal efforts have been applied to reduce the absolute risk, meaning that, as long as the risk is equally distributed, no matter how high the risk is the situation will be considered just. Critics condemn it for distracting EJ from risk reduction and concentrating on risk distribution.

From a critical viewpoint, we need to ask whether current methods are the best way to represent EJ. Current analyses of EJ have been driven by notions of distributive justice that have moulded, and sometimes warped, our understanding of it. Research of this kind is grounded in scientific understanding of how the spatialised nature of industrial risks leads to their disproportionate distribution, disparate exposure/burdens, and unequal protection among populations. These issues

undoubtedly need further ontological scrutiny. When one uses lines, points, or circles to measure EJ, the implication of such ontology is that social relations can be abstracted into geometry. Similarly, when the complexity of risk is simplified by a series of numbers, one automatically accepts a certain conceptualisation of time, space, chemicals, and human bodies.

Undoubtedly this view is highly problematic, because such an ontological assumption may distort the reality we are testing (Sheppard and McMaster 2004; Batty 2005). More seriously, the adoption of this ontology distracts researchers from the central point of EJ and generates a sense of objectivity and a specific attitude toward social changes. As we have seen, current EJ debate has become rather sterile as it is dominated by the structure of technologies, GIS and risk assessment, rather than by the structure of the problems faced in real life (Sui 1994). EJ debate has been turned into technical terms even though its scope should go far beyond the technical. To me, rethinking what EJ means is a preliminary step toward a better understanding about past tensions among different research communities.

7.2.2 Epistemology: How we know that we know?

Epistemology is the theory of knowledge. It deals with the fundamental questions of how we know reality and how we know what we know. Often, the terms ontology and epistemology are conflated because they are closely linked. In general, ontologies are something separate from the methods that one uses to study them, but they are construed through epistemology. More concretely, epistemology refers to the research perspective that a researcher uses to interpret the world. How observers study and understand the world contributes to the ontologies that are often taken as self-evident by the observers (Sui 1994; 1996; Schuurman 2000; 2004; 2005).

In EJ, epistemological debates come from the basic fact that no one can actually "see" how risks are distributed among social groups; therefore, one has no choice but to rely on scientific knowledge to conceptualise and visualise these risks. To do so, risk analysts and GISers calculate the risk and then draw a risk-exposure map to

demonstrate risk's distribution. Obviously, the whole process of visualisation and calculation is essentially computer-rooted. This computational nature highlights EJ's epistemological deficiencies because how space and risk are observed (how we know it) affects what we can know.

The politics of scale exemplifies the effect of diverse epistemologies (Smith and Dennis 1987; Herod and Wright 2002; Howitt 2002; Sheppard and McMaster 2004; 2009). Within human geography, researchers hotly debate scale's ontological status, particularly whether scale really exists as social products, or is simply a mental device for the convenience of categorising the world. Reflecting different ontologies, idealists and materialists draw on different epistemologies. For those who adopt Kantian idealism, scales are no more than useful conceptual mechanisms for ordering the world; in this way, different processes and practices can be distinguished from one another. Under this thinking, scales like local, regional, national or global are only used for practical reasons. On the other hand, those who draw upon Marxist ideas of materialism argue that scales are social products and, as such, there is a politics of scale to scale's construction; through processes of struggle and compromise, scales are socially constructed and presumably have material political effects. Following this line, the scale "local" is not simply a scale which exists at the bottom of a scale hierarchy. Instead, "local" must be brought into being through active political and economic processes (Herod 2009).

In the case of EJ, as I have demonstrated, activists sometimes do act within a given scale without even noticing other alternatives. For instance, a typical NIMBY struggle usually defines itself as a local struggle. More often however, activists do not simply accept a given scale and act accordingly. Rather, when advocates identify their movement as a local/regional/national/global struggle, they must build their own scale of operation to *make* EJ local/regional/national/global. Take the Warren case. In order to avoid the criticism of (local) NIMBYism, EJ re-branded itself as regional (GAO case) or national (UCC case) and gained its political impetus. Surely, the reverse argument can apply as EJ critics also use scale politics to *lock* EJ's operation into a specific scale. The scale war is the archetype. By shifting the

analytical unit from zip-codes to census tracts, the second-wave challengers attempt to reinterpret EJ as a regional or a local phenomenon. By so doing, EJ's political momentum is largely restricted. In brief, the scale of EJ never appears automatically in the standard scale lists of local, regional, national, or global.

Risk-based research is also closely linked to epistemological issues. While there are a number of issues at stake, one key concern is about the nature of risk (Yearley 2004 Ch 9; Zinn 2008b). In the field of EJ, risks are often understood through two diverse categories: actual risk and perceived risk. Opinion is subsequently divided on the epistemological status of risk. However, for general characterisation of approaches, it is common to theorise risk as a continuum between realist and constructivist (Zinn 2008a). It is fair to say that EJ theorising lies on the side of constructivist, which is opposed to the realist technical-science perspectives.

For most risk assessors, risk is real and it can be scientifically modelled. In order to evaluate the risk one is facing, uncertainty must be converted into numbers through calculation. From this viewpoint, it is believed that modelling can and does reveal what is really going on. For most EJ promoters, it is believed that calculation alone cannot capture the full picture of risk, as certain aspects of risk cannot be reduced to computational details. Moreover, this camp also believes that risk is both socially and culturally constructed; thereby, various social and ethnic groups may have completely different views toward risk. To better understand risk, other ways of knowing are needed, they argue.

As one may have already noticed, positivism is the epistemological basis for both risk- and spatial-rooted EJ analysis. Although positivism means different things to different people, a central point of it is that observation precedes theory. That means, observations must be repeatable and theories are constructed on the basis of these repeatable observations. For many, positivism has become synonymous with science and scientific method (Schuurman 2004:28). As Sui (1996) has pointed out, two epistemological positions have dominated EJ's current computational reasoning:

visualisation-based empiricism and analysis-based rationalism[96]. The first position believes that knowledge has to be derived from observation. Following this thinking, knowledge is treated as the product of sensory perception. Through our sensory organs, probably helped by some observational instruments, researchers reflect and map the external objects in our mind. GIS and the mapping techniques exemplify research of this kind. The second position sees knowledge as the product of rational reflection through statistical analysis and modelling. A wide range of risk assessments and GIS analyses lie in this group. However, among all possibilities, these two positions are not the only ways of knowing what we know; therefore, these positions marginalise other insightful epistemologies.

In reading this thesis, my readers cannot go unnoticed that something is missing in the current EJ literature. There is an absence of a broader normative debate over what justice is. To everyone's surprise, environmental "justice" may sound like a term which lies in the domain of normative debates but in fact current literature shows no such features. Most debates are still locked in a narrow scientific/positivist sphere. People hotly debate how best to measure justice. This positivist argument, it seems to me, is another example of "circular definitions". The only evidence available for environmental injustices are the studies cited to represent such evidence. The problem is this: we will only detect the specific kinds of injustice that we choose to investigate. What we uncover by EJ research will always be shaped by how we understand and measure it.

7.2.3 Methodology (praxis): How analysis is conducted?

The combination of ontology and epistemology defines one's methodology. Methodology refers to a set of rules and procedures concerning how data are collected and how analysis is conducted (Sui 1994). As methodology is about the way ontology and epistemology work in practice, methodology is more tangible. Nevertheless one's methodological bias is no easier to discern considering that it is

[96] Although Sui did not extend his interpretation to risk-rooted research, I believe that his observation applies to all EJ research.

often clouded with its practices.

Under the banner of (EJ) science, most truly meaningful discussion is hidden beneath several veneers of technical operations. After the institutionalisation of EJ, it is more so since researchers simply follow the routines to define EJ. In this light, current EJ application is simply a set of operational rules which transform the predefined ontology and epistemology into practice. The practice in itself however may have nothing to do with “EJ”. For instance, impact circles are becoming increasingly fashionable in testing EJ. These circles allow researchers to construct various layers and buffers to simulate EJ communities. Its technical nature soon distracts our attention away from the heated debate as to which circles can best represent the impact area. Few GIS users ask why they are applying this particular technique or why these impact circles are relevant to EJ. What is more, researchers are able to manipulate their results by their selection of maps and scientific models. As Monmonier (1996) has long cautioned, they “lie with maps”. One example of this is the aforementioned Lipari Landfill case. By choosing smaller analytical units, one can conceal the boundary problem under the layers of mapping applications. Without consulting a map, it is almost impossible to note where this landfill is really located. The problem is, if one simply follows the second-wave tenet, “the smallest unit is always best”, one may never test EJ at other levels.

Arguably, an outright lie should be easy to detect. More often however, the real problem lies in researchers' unintentional ignorance about inherent methodological limitations. For instance, when Taiwanese EJ activists claim that half of the national parks are located in indigenous people's lands, they sneak a specific way of seeing and representing the world into their argument. The unspoken assumption is that the scale employed in this study involves such large indigenous territories that most of Taiwan lies within one of the territories. Thinking in this way, one easily comes to a conclusion that most national parks fall within the domain of indigenous lands. This study represents only one way of understanding the world; other analytical units/scales can be used as well. For example, taking reserves as the unit restricts the indigenous lands to a much smaller area, which constitutes less than 3% of the

national park area. It is very hard for anyone to claim injustice on the basis of this 3%. Of course, they are each simplistic characterisations of a complex geographical and historical reality, but as a researcher we must not forget the fact that our research only represents one oversimplified view, rather than a full picture.

Another related issue is that researchers usually overlook the fundamental questions about how data are collected and what kinds of categories are adopted in making the original observations. Most data adopted in EJ are secondary data compiled by governmental or private agencies. The agenda of such agencies influences why/how/which/when data are collected. In this way, some social and political presumptions have been *built* into these data even before they are analysed. In turn, this agenda affects which conceptual questions can be empirically asked and which kinds of answers are possible (Sheppard 1993:458). An increase in the volume of data does not guarantee an increase in our EJ knowledge. One example of this is the way EPA regulates pollutions. EPA's datasets make TSDFs and TRI easier to evaluate empirically; in turn, its agenda of data collection implicitly channels EJ in a certain direction, i.e. toward a research of "hazardous facilities".

The ontological and epistemological assumptions of EJ set limits on EJ's methodology. What can be said and done in EJ is predefined within a given context. Put it another way, the widespread use of spatial and risk-based approaches imposes a particular angle of thinking about (environmental) rights, responsibilities, and reality. Looking into the EJ research, it is necessary to understand that EJ is practiced in a specific social, cultural and political context where the body, the household, and nature are implicated in a patterning of impacts on health and wellbeing (Walker 2009). Our research could become much more meaningful if things are put in context. Unfortunately, the bigger contexts are often missing in our current scientific/positivist vision of EJ research. Without careful consideration, there is the danger of being blinded by the routines of EJ assessment.

7.2.4 Ethics: The rightness/wrongness of human conducts

Ethics deals with the rightness and wrongness of human conduct. It is the theory of values concentrating on people's actions, motives, and the ends of their actions (Sui 1996; 1999). In this section, I will not go into the already heated philosophical debates of what defines and constitutes a justice condition. Rather, I seek to further explore the ethical concerns posed by both scientific and policy-oriented research. While these ethical concerns seem like obvious discussion points, it is rare to find them made within EJ scholarship.

The first issue is concerned with the improvement of technology. EJ discourse has positioned the need to visualise risk in the centre of its arguments, and rightly so given the need for computational implementation. Much of the EJ debate has been locked into the expectation that better technology will bring a fairer future. The third wave positivists are especially enthusiastic about this better-technology-better-future scheme. Examining cases of EJ, it is clear that the opposite is the case. With improvement in technology, we seem to sink even deeper into the mire of "known unknowns". Knowing so little about EJ, the third wave philosophy suggests we *wait* until all data are in. If waiting is the answer, clearly technology itself cannot automatically ensure a fairer society.

The second issue is related to the first. The formalisation of EJ also poses an ethical concern. As we have seen, no information system could be sufficiently sophisticated to process all possible ways of observing all possible phenomena (Sheppard 1993). A formalised process is usually uni-dimensional. The very process of formalisation could obscure the multifaceted meaning of EJ, its relationship to other social issues, and the contexts in which they are developed and used. Our current computational EJ has reinforced certain dimensions of justice in which science plays a key role. This scientific view is problematic. Some unjust factors are already imbedded in the process of knowledge-making. For instance, categories and scales reflect a certain stance on social and political values; different groups will resort to different scales to bolster their position. More often than not these values are clouded under layers of scientific operations.

Thirdly, it has become clear that while most scientists claim to be impartial, researchers' ideologies are in fact hidden behind their scientific claims. At one extreme, we have the second-wave adherents who explicitly promote their neo-liberalist stance; at the other extreme, people from the third wave camp are hiding behind the banner of scientific neutrality, and claim that the only way to determine justice is through the lens of impartial science. However, when they stick to the scientific standard, say the 95% rule, they are implicitly defending the status quo, as this rigid scientific standard implies that we do nothing until all the data are in. The problem is we will have to wait indefinitely.

Fourthly, although understanding EJ from a scientific view is seductive, the so-called scientific evidence is often contentious. Ironically, the scientific label with which EJ advocates were later saddled may have been due to their own promotion of the movement as scientific. In the context of EJ, tangible EJ evidence can only be provided through scientific analyses. For this reason, the GIS technology and risk assessment deeply foster the discourse of EJ. It seems that many researchers have become "hired guns" (Sui 1996). As we have seen, people from different camps accuse each other of manipulating evidence. For example, Bullard (1994d) refereed SADRI's research as *ChemWaste-fund*; conversely, Bowen referred several first wave studies as *church* publications (Bowen 2002). Critics have expressed doubts about this scientific understanding of EJ because it seems that EJ science has implicitly promoted the surveillance capabilities of academics, the state, the capital, and even the church. Accordingly, democratic practice and the capability of grassroots groups are hampered (Sui 1996).

Another ethical issue which EJ scholars have increasingly recognised is that those who control the technology and have access to the information get the final say (Sheppard 1993). My thesis has made it clear that data and information are not simply empirical, problem-solving tools. EJ can only be recognised in its applications and practices. Information and power are closely linked because their applications impact the distribution of expertise and power in society. The intimate relationship between information and power is especially important for EJ. At a

glance, it seems that the development of technology provides everyone with better access to environmental information. Due to this very thinking, the EPA is devoted to promoting a collaborative model which could, at least in theory, put information back in citizens' hands (US EPA 2002; 2003a; 2003b). To this end, the EPA even constructed a user interface system called "Environmental Justice Geographic Assessment Tool"[97]. However, having easier access to datasets may distract our attention from first-hand data collection. The distraction, in turn, could hamper EJ's achievements. In the end, a great quantity of data cannot help us answer the question of whether these data are appropriate for the question we are asking. What technologies make easier are the instrumental goals, which may in fact narrow our vision of alternative and other equally important EJ insights. Moreover, state and industrial bodies will find it easier, not harder, to take advantage of such technologies (Sheppard 1993; Sui 1994). This inequality of access to information will reinforce the existing power imbalance.

7.2.5 Politics: Power struggles

As seen from my analysis, political struggles are hidden behind EJ's moral and scientific claims. To me, three levels of EJ politics especially need our attention: the definitions of EJ, the scientific interpretations of EJ, and the dynamic power relations within EJ struggles. In order to better understand these levels, a critical first step is to understand how EJ's construction is indeed social. The second step is recognising the potential for scientists' claims about EJ. Illustrating that a feature of EJ emerged from a particular set of circumstances provides us both social and scientific bases for possible refinement and perhaps better models of EJ policies.

It is important to have a clear definition of EJ because both analysis and dissent are engaged in addressing and redefining definitions to make their points. Terms like environmental racism, environmental equity, and EJ are sometimes used interchangeably. It is very likely that these terms mean very different things to different audiences. EJ activists and its challengers choose their terms to suit their

[97] http://www.epa.gov/compliance/environmentaljustice/assessment.html .

audience, in order to promote, or weaken, the movement. In brief, these terms are not chosen randomly and the analysis of EJ has been driven by these definitions. The EJ movement first gained its momentum under the banner of being "against environmental racism". Before long, activists found that this term restricted EJ's scope and its ability to reach broader audiences. In order to incorporate more people, mainly the poor, into the movement, the term racism was dropped, and a new concept, *environmental equity*, was introduced. As the term of equity implies a policy of risk re-distribution, rather than risk reduction, a broader term *EJ* is adopted. Although everyone seems to agree that EJ is the term for addressing the issue, the full effectiveness of EJ has not been reached in any way as EJ itself has become a moving target.

After unpacking EJ and examining the processes that lead to its construction, it is revealed that many EJ arguments, if not all, are vague both semantically and scientifically. As critics have already pointed out (Harvey 1999), EJ has carried too many unexamined assumptions. One need simply scroll down the list of EJ cases to see just how hollow the status of EJ often has been. Learning from the success of EJ, theorists attempt to derive other types of (in)justices from its original meaning. We now have food justice (Sze and London 2008; Alkon and Norgaard 2009; Wilson 2009), flood justice (Maantay and Maroko 2009), recreation justice (Tarrant and Cordell 1999; Floyd and Johnson 2002), and even graffiti justice (Burningham and Thrush 2003; The Scottish Executive 2005). It seems to me, given the present range of variation among pertinent cases, some of these assumptions need to be made more explicit and submitted to critical examination, if we are going to achieve a theory of adequate scope and empirical grounding.

Some may think that policy-making is the priority, while debates over definitions are something on the sideline. In fact, what makes EJ so difficult to refute when applied to policy is that it means so many different things. Certain definitions tend to help support particular value judgements and policy preferences. The precise meaning assigned to these key terms is often the battleground over which policy is finally selected by the authorities. Given that different causes require different policy

solutions, ambiguous and uncertain definition can easily hamper the solutions of the problems identified by the EJ activists. In this respect, disputes over semantic nuances are themselves a policy debate. That is why the debate over a semantic nuance is really a surrogate debate over value judgements and policy preferences.

In terms of scientific interpretation of EJ, as demonstrated above, I have made the limits of this rationale clear. Briefly, in spite of the early consensus, close to two decades of EJ research has still failed to produce conclusive evidence in support of their hypothesis, resulting in a divided field of study. Therefore, calls for more research are widespread among both EJ researchers and decision-makers. In most environmental debates, root differences lie in values and preferences, not science and facts. Categories such as EJ, environmental racism and others must be relational and contextual. These concepts do not exist outside particular reference frames, which are in turn defined in a particular space and time, by particular groups of people, and for particular purposes. In this respect, it is fair to say, although the scientific interpretation of EJ is tempting, because EJ is fundamentally about conflicting values, science alone will not resolve this normative debate.

Finally, we should take into account that EJ, in its content and in its application, is largely a dynamic condensation of power relations, not just a rationalised technique for ordering of social relations. Take the politics of scale. Scale is socially constructed but it also produces some social outcomes. That means, once we adopt a scale as our analytical unit, this scaled social problem will then redefine its political resolution. In this politics of scale, as we have seen, powerful institutions, like industry, usually win the scale debate, as they have more resources and a better chance of convincing agencies and the wider public that they are simply following the general market rule. Under neo-liberalist thinking, the market is considered neutral so that no one is responsible for the consequences of market forces. In this way, it justifies the outcome of unequal distributions. By defining EJ activists as self-interested and “local”, industry could evade or counteract the EJ criticism. Fighting a seemingly losing battle, it is worth noting that other powerful institutions, such as governments, politicians and even EJ groups, are also able to redraw the scale to

encompass wider-scale forces. The first wave brigade made a concerted effort to redraw EJ's scale. They overcame the criticisms of NIMBYism, and successfully redefined their scale from local to national.

From the above case, we find opportunities in terms of identity, difference, territory and governance. Nevertheless, we should not overlook the obstacles in this EJ politics. As some (Kuehn 1996; Gleeson and Low 2003; Davidson 2009) have highlighted already, behind EPA's slogan of good science, the demand for a risk-based EJ assessment may in fact have nothing to do with the scientific evidence that backs up its regulation. The unspoken reason is that reliance on the resource-intensive risk assessment would delay the process of regulation. In other words, asking for more risk assessments is a delay tactic to slow the pace of regulations and has become a different form of the Reagan-Bush(s) deregulation policy. Risk assessment is highly resource-intensive and EPA's capability of generating sufficient data for EJ assessment is dependent on its budget. By cutting its already limited budget, EJ suffers accordingly. In this way, EJ politics brings both opportunities and obstacles.

7.3 Moving forward: What is the future of EJ?

To conclude this thesis, let us return to where I started: the nightmares of New Orleans and the 8/8 floods in Taiwan. After these catastrophes, EJ arguments suddenly mushroomed. Different types of environmental injustice, such as environmental racism or regional injustice, were soon singled out as the thing to blame for the crisis. In Taiwan especially, people compare the 88 floods with New Orleans and then argue that Taiwan's current environmental policy is unjust.

To hear such comments, one would come to the conclusion that injustice does exist in Taiwan. However, this thesis argues that scholars and activists must not to jump to conclusions. The challenge of EJ in contemporary environmental sociology is that it presents a paradox. On the one side, EJ seems entirely self-evident, that is, we do not have to conduct any research to know that environmental goods and ills are often

unequally distributed. When floods happen, we blame EJ for the unequal way in which floods affect poorer communities; when pollution occurs, we also point our finger to environmental injustice. A famous EJ researcher, Manuel Pastor, once recalled the day he proudly told his aunt about his recent EJ funding. After explaining the meaning of EJ to his aunt, she replied: "But, Manuelito, everyone knows that" (McNulty 2004). This example is anecdotal, but it reveals a basic truth. For example, after the 88 floods, the Taiwanese STSers soon started a reading group to absorb the Katrina-related articles in *Social Studies of Science* **37**(1). Before long, the term EJ appears in newspapers and magazines; it triggers heated debates on the internet. I believe this online debate is a serious argument, but does not cover the whole story. As I have shown, EJ is a term that easily slips into our discussion since the scaled processes of EJ have been taken for granted by most.

Before this thesis, the constructed nature of EJ remained paradoxical, because most literature could not offer a satisfactory description of just what was being constructed. For a long time, it was assumed that EJ lies in those things cited to represent such evidence. What emerges from this thesis is that EJ is a practice of boundary work, or a practice of inclusion and exclusion. Thinking in this way, approaches which attempt to sum up a dimension with the gloss of labels such as justice and injustice become less meaningful. Without engaging with what or who is actually included within the scope of the term, our discussions will miss the substance of the term, and more seriously we will miss the phenomenon it represents.

Gleeson and Low (2006) once wrote an article with the title, "If sustainability is everything, maybe it's nothing?"; it seems to me that EJ suffers the same syndrome that they diagnosed in sustainability. Surely, EJ is not everything but it is not nothing either. To make a more fruitful and meaningful argument what we should ask is not, as the aforesaid Taiwanese EJ attitude survey did, whether or not we support EJ; rather, the question is which "EJs" one supports and why. Further, a more consequential question is why people use the EJ label to address a phenomenon. The SSK message that we can take with reference to EJ is that we can understand a lot about the EJ movement by examining the social forces that shaped its development.

Too often, as researchers have delved into the immediate demands of their respective domains of inquiry, these social factors have gone unnoticed.

Without understanding this multifaceted nature and the social factors behind it, one is easily locked into the debate of which one definition is superior to all the others. This sense of superiority can easily cause a real bottleneck. For example, when two moral worlds collide head-on in the case of national parks, both sides insist their own version of EJ is correct. Since both sides treat making compromises as making an accommodation with injustice/evils, neither sides deliver a workable alternative. Once different types of EJ are used to against each other, the movement falls victim to this semantic war. The only one who benefits from the deadlock seems to be the government. Without an achievable goal EJ was either too narrowly or too broadly defined to suit the convenience of the government. A more serious danger is that, the public may believe that justice/EJ is being done, when in fact these government definitions may have helped disguise the status quo.

So far, most critiques of EJ have been refuted by the EJ community or have been dismissed as anti-EJ or even anti-environment. In general, most questions raised by EJ critics have not been sufficiently discussed in the EJ publications. Specifically, the ontological and epistemological issues in EJ have not received adequate attention in recent EJ literature. It seems to me that both sides see the issues through their own parochial lenses and refuse to see that their EJ methodology itself is also value-laden, rather than impartial or neutral. It is value-laden because we, the public, have to ask ourselves in the face of uncertainty and information deficit how much we are willing to spend in exchange for earlier protection. Evidently, the information about risk distribution is a trade-off between science and protection, and the question of how much information is sufficient for EJ decision-making is not a scientific decision but a social one.

I suggest that like other important EJ-related concepts, such as risk or scale, EJ itself is rendered most meaningful in its development as an empirical generalisation. We can only understand this concept by building up an understanding of complicated and

dynamic relationships and processes in context. The label of EJ itself is secondary: just labelling something EJ does not make it an EJ issue. Seen from this angle, EJ loses the statistical connotations that it tends to have when conceived solely as a regime, and shows that it is itself that moving target. If this analysis is correct, our intellectual endeavours should properly be conceived as being about a theory of endless EJ struggles, rather than simply about EJ. To this end, activists and scholars should prepare a set of effective policies, rather than a single policy, to realise their intentions because a single set of EJ does not always suit our best interests (Huang and Hwang 2009a). Likewise, policy-makers should also prepare an approach that would be useful to adherents of all EJ frameworks and to highlight issues where different policy frameworks might clash. Only if we take EJ as a potentially contested form, decision-makers could be helped to anticipate how features of different policy options might be attractive to stakeholders who adhered predominantly to one or the other EJ frameworks (California EMF Program 2002:1-4).

It is worth noting, to say that EJ is socially constructed does not mean that EJ does not exist, it simply means that it cannot exist without the interplay of power and knowledge. After its institutionalisation, EJ was further reduced to the level of routine practices of scientific measures which do not acknowledge the true scope and complexity of EJ. In the beginning, it appeared a good idea to make EJ scientific. As time goes by, recent literatures have become keener to use standardised geometrical and statistical measures in capturing the phenomenon of EJ. Activists' efforts to theorise EJ have gradually distracted EJ from its social contexts. This promotion of the movement as science later hindered the progress of EJ because recent scientific debates were taken out of their social contexts (Walker 2009). As a result, I must say that the current scientific reading of EJ *hides* precisely the terrain in which EJ advocates are most interested. If the role of EJ is to better facilitate us in our situated engagement in struggles for justice and sustainability, to divorce these issues from social contexts is counterproductive.

Accepting for the moment these narrowly circumscribed EJ categories, I would argue

that, if EJ is about anything, it is about the science that rests upon the measurement of how risk is distributed. But this scientific description in no way paints the full picture. EJ is about power struggles as well, about the production of power and about how different groups are eager to control the process of knowledge-making. Again, by arguing that EJ is a constructed social phenomenon, I do not mean that it is irrelevant, rather that the debates and the issues have moved to a different level, and as a result the character of the debate has changed. This thesis has made this constructive nature much clearer.

So, what is the future of EJ? There is no definitive answer to this question. It will largely depend on the emerging consensus on the five elements I have discussed in this conclusion and in the answer to the fundamental question of what constitutes EJ. Highlighting the fact that EJ is based on factors other than science sheds new light on the underlying values supporting the EJ argument. Understanding these social factors will stimulate the current EJ discourse to provide an alternative rationale for future decision-making, where science is used to inform, and the limits of science are made clear. To this end, I will say that a quality and defensible decision is not the one which is objective, but the one which is rational. That is, science is used to inform the rationale; the rationale itself however is subject to criticism and challenge (cf. Hetes 2007:1009-1010).

There is, of course, no easy solution and no single correct path to follow. The struggle to achieve meaningful and sustainable benefits for minorities throughout different nations will produce a range of approaches. It is important that EJ activists, especially those in Taiwan, do not overlook the importance of bringing the US precedents to bear on their own priorities, rather than seeing these precedents as a model to reproduce in Taiwan.

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